GROUP D

Custom Industrial, Agricultural, and Commercial (CIAC) 2022 Impact Evaluation

California Public Utilities Commission
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Glossary of key terms and acronyms

Accelerated Replacement (AR) – The Accelerated Replacement MAT is used for the replacement of existing equipment that could and would remain operational without program intervention. It is used in direct contrast to the NR MAT, which is used when existing equipment either could not or would not remain operational. Accelerated replacement (non-capacity expansion) measures and replacement of "operating equipment that when broken, non-functional, or unable to provide the intended service is typically repaired" can be classified as AR.

Add-On Equipment (AOE) – The Add-On Equipment MAT is used for installations of new equipment onto pre-existing equipment, improving the nominal efficiency of the host system. The existing host system must be operational without the AOE equipment, continue to operate as the primary service equipment for the existing load, and be able to fully meet the existing load without the add-on component. The add-on equipment must not be able to operate on its own. The actual energy reduction occurs at the host equipment, not at the add-on component, although any add-on component energy usage must be subtracted from the host energy savings.

Authority Having Jurisdiction (AHJ) – Refers to the organization, agency, or individual responsible for ensuring that the codes, standards, and regulations are followed within their jurisdiction, and they have the authority to enforce them, issue permits, and conduct inspections. AHJs may vary depending on the location and jurisdiction, and it is important to identify the specific AHJ for a particular project or activity to ensure compliance with applicable regulations.

Behavioral, Retro-commissioning, and Operational (BRO) – The Behavioral, Retro-commissioning, and Operational MAT is used for measures that either restore or improve energy efficiency and that can be reasonably expected to produce multi-year energy efficiency savings. By definition, BRO measures result in performance that does not exceed the nominal (rated or original) efficiency of the pre-existing condition. EE savings from correcting deferred maintenance, performance restoration, and operational characteristics are considered within the BRO category. In the case of either normal or accelerated equipment replacement, separate claims should be made for energy savings related to the equipment replacement and energy savings related to operational factors and updating maintenance. There are three BRO subtypes: BRO Behavioral (BRO-Bhv), BRO Operational (BRO-Op), and BRO Retro-commissioning (BRO-RCx).

Building Weatherization (BW) – The Building Weatherization MAT is used for non-mechanical building efficiency improvements such as windows, insulation, air sealing, and duct sealing.

California Energy Data and Reporting System (CEDARS) – Refers to the database that securely manages California Energy Efficiency Program data reported to the California Public Utilities Commission (CPUC) by Investor-Owned Utilities (IOUs), Regional Energy Networks (RENs), and certain Community Choice Aggregators (CCAs).[1]

California Electronic Technical Reference Manual (eTRM) – A statewide repository of California's deemed measures, including supporting values and documentation.

California Technical Forum (Cal TF) – A collaborative of experts who use independent professional judgment and a transparent, technically robust process to review and issue technical information related to California's integrated demand side management portfolio. The Cal TF was created in 2014 by a broad group of stakeholders and is funded by participating program administrators.

[1] California Energy Data and Reporting System (CEDARS), "Welcome to CEDARS," cedars.sound-data.com, https://cedars.sound-data.com/

Custom Core Template (CCT) – DNV created an Excel-based CCT to organize and communicate evaluation information for each claimed project in the sample. This spreadsheet was used to ensure a uniform and systematic approach to determining and communicating gross savings methods, calculations, and results.

Custom Project Review (CPR) – Refers to the process of selecting custom projects, submitted biweekly by the program administrators, for review of all forecasted savings parameters and supporting documents of selected projects.

Database for Energy Efficiency Resources (DEER) – Refers to the Database for Energy Efficient Resources. This database contains information on energy efficient technologies and measures. DEER provides estimates of the energy-savings potential for these technologies in residential and non-residential applications. DEER is used by California Energy Efficiency (EE) Program Administrators (PAs), private sector implementers, and the EE industry across the country to develop and design energy efficiency programs.[2]

Design Light Consortium (DLC) – Provides a list of certified lighting products used for energy efficiency lighting projects.

ED tracking data – Refers to the officially claimed electric and gas impacts as captured in the CEDARS (defined above) data and reporting system.

Energy efficiency measure (EEM) – An energy using appliance, equipment, control system, or practice whose installation or implementation results in reduced energy use (purchased from the distribution utility) while maintaining a comparable or higher level of energy service as perceived by the customer. In all cases, energy efficiency measures decrease the amount of energy used to provide a specific service or to accomplish a specific amount of work (e.g., kWh per cubic foot of a refrigerator held at a specific temperature, therms per gallon of hot water at a specific temperature). For the purpose of these Rules, solar-powered, non- generating technologies are eligible energy efficiency measures (D.09-12-022, OP 1).

Effective useful life (EUL) – An estimate of the median number of years that the measures installed under the program are still in place and operable.

Free-ridership – Program participants who would have installed the program measure or equipment in the absence of the program.

Gross realization rate (GRR) – Refers to the ratio of achieved energy savings to predicted energy savings; as a multiplier on Unit Energy Savings, the GRR considers the likelihood that not all CPUC-approved projects undertaken by IOUs will come to fruition.

Gross savings – Gross savings count the energy savings from installed energy efficiency measures (EEMs) irrespective of whether those savings are from free riders, i.e., those customers who would have installed the measure(s) even without the financial incentives offered under the program.

High Opportunity Projects or Programs (HOPPs) – A program to offer a systematic process to identify operational and maintenance improvements that optimize building performance and ensure that building systems function efficiently and effectively. HOPPs RCx is designed to ensure persistence of savings by requiring customers to commit to a three-year maintenance plan.

International Performance Measurement and Verification Protocol (IPMVP)[3] – Refers to the protocol that facilitates a common approach to measuring and verifying energy efficiency investments. IPMVP incorporates M&V best practices in a

[2] Public utilities commission of California, Resolution E-5152, August 5, 2021. http://www.deeresources.com/files/DEER2023/Resolution%20E-5152%20DEER2023%20Complete.pdf

[3] IPMVP - Efficiency Valuation Organization (EVO), evo-world.org, https://evo-world.org/en/

non-prescriptive framework that allows it to be applied flexibly based on a measure's application and the information available.

Lifecycle savings – Refers to the savings associated with the lifetime of an efficiency measure installed by a program participant. Lifecycle energy savings depend on the assigned measure application type and the measure EUL.

Measure – See "energy efficiency measure" definition.

Measure application type (MAT) – Refers to the installation basis for each claim. There are seven approved measure application types: Add-on Equipment, Accelerated Replacement, BRO-Behavioral, BRO-Operational, BRO-Retro-commissioning (RCx), New Construction, and Normal Replacement.

Metric million British thermal unit (MMBtu) – A unit traditionally used to measure heat content or energy value. MMBtu is the common unit upon which sampling is based.

Net savings – Refers to the savings realized when free-ridership is accounted for. Savings are calculated by multiplying the gross savings by the net-to-gross ratio.

Net-to-gross ratio (NTGR) – A ratio or percentage of net program savings divided by gross or total impacts. Net-to-gross ratios are used to estimate and describe the free-ridership that may be occurring within energy efficiency programs.

New Construction (NC) – The New Construction MAT is used where equipment is installed in either a new area or an area that has been subject to a major renovation, to expand capacity of existing systems, or to serve a new load. The NC MAT is used where there is no reference operation for existing conditions, such as with new construction, expansions, added load, a change in the function of the space (e.g., office to laboratory), or a substantial change (e.g., ~30% or more) in design occupancy. New construction, capacity expansion, and replacing "equipment that is actually broken, nonfunctional, or unable to provide the intended service" is eligible for normal replacement, but ineligible for AR.

Normal Replacement (NR) – The Normal Replacement MAT is used where existing equipment (including Add-On Equipment) has either failed, no longer meets current or anticipated needs, or is planned to be replaced for reasons unrelated to the program. The NR MAT may be applied to any measure or program, with certain exceptions, and without a burden of proof. This MAT includes measures that previously fit into the now-retired Replace on Burnout (ROB) MAT.

Normalized metered energy consumption (NMEC) – Refers to population- or site-level programs (HOPPs) that provide incentives based on metered energy consumption. This initiative fulfills the directive for utilities to quickly identify high energy-efficiency savings opportunities in existing buildings and include only CPUC-approved NMEC building programs.

Outdoor air temperature (OAT) – Local climate zone (CZ) weather data was often used to regress equipment operation for weather dependent data to estimate annual operation.

Preponderance of Evidence (POE) – The standard to demonstrate that the replacement of inefficient equipment or process with a more energy efficient one more likely than not resulted from an energy efficiency program offering and would likely not have happened otherwise.

Program Administrator (PA) – An entity tasked with the functions of portfolio management of energy efficiency programs and program choice (i.e., Marin Clean Energy (MCE),[4] Pacific Gas & Electric (PG&E), Southern California Edison (SCE), Southern California Gas (SCG), San Diego Gas & Electric (SDG&E)).

[4] MCE is a not-for-profit public agency that MCE provides electricity service to more than one million residents and businesses in 37 member communities across four Bay Area counties: Contra Costa, Marin, Napa, and Solano.

Peak demand savings – Refers to the average demand impact, for installed or implemented measures, as would be applied to the electric grid. CPUC Resolution E-4952 approved the Database for Energy-Efficient Resources (DEER) for 2020. Additionally, this resolution revised the DEER Peak Period definition from 2:00 p.m. to 5:00 p.m. to 4:00 p.m. to 9:00 p.m. on the three costliest days of the year as determined through the Avoided Cost Calculator, effective January 1, 2020. In accordance with the CPUC memo issued on 03/21/19, operationalizing the 2020 DEER Peak Period change, effective January 1, 2020, per CPUC Res E-4952 for custom projects shall follow the Statewide Custom Project Guidance Document, Version 1.4.

Relative precision – A ratio of the error bound divided by the value of the measurement itself. This provides the error on a relative basis that is frequently used to show uncertainty as a fraction of a quantity. In this report, all relative precisions are provided at the 90% confidence interval, which means that in repeated sampling, 90 times out of 100 the true value will fall within the lower and upper bounds of the estimate.

Remaining useful life (RUL) – An estimate of the median number of years that a measure being replaced under the program would remain in place and operable had the program intervention not caused the replacement.

Standard practice (SP) – The Standard Practice Baseline is an estimate of the activity or installation that would take place absent the energy efficiency program, as required by code, regulation, or law, or as expected to occur as standard practice.

The Standard Practice Baseline activity or installation must meet the anticipated functional, technical, and economic needs of the customer, building, or process and provide a level of service comparable to that provided by the energy efficiency (EE) measure. Savings claims shall be generated based on equipment choices that operate at a level of service comparable to that provided by the EE measure. If there is not a viable and comparable baseline solution that offers a comparable level of service as the EE measure, the energy use of the baseline solution must be adjusted to provide a level of service comparable to that provided by the EE measure.

Statewide – Energy efficiency programs or activities that are essentially similar in design and available in all CPUC regulated utility service areas in California, administered by a CPUC-specified PA.

1 EXECUTIVE SUMMARY

INTRODUCTION

This evaluation report presents the findings and impacts of the California Program Administrators' (PAs) 2022 Custom Industrial, Agricultural, and Commercial (CIAC) programs. DNV independently determined how much the claimed electric demand and energy and natural gas energy savings were realized by custom projects (i.e., non-deemed[5] savings claims) in the CIAC programs. Custom activity in this report refers to large commercial and industrial (C&I) and agricultural project activity involving complex equipment and systems requiring site-specific savings calculations. This determination of savings includes claims from non-residential new construction program projects, referred to as Savings by Design.

Overall goals

The goals of this study were to:

1. Develop first-year and lifecycle net and gross savings for the Custom program at a high level of precision.
    a. Lifecycle savings refer to the savings that occur over the lifetime of an energy efficient technology or measure installed by a program participant. Calculating this can help determine the amount of realized savings a measure might provide over its lifetime.
    b. Gross savings are changes in the energy consumption of program participants that result directly from the installed energy efficiency measures (EEM), regardless of why they participated.
    c. Net savings are changes in energy use attributable to a particular energy efficiency program, i.e., energy savings that would not have been realized without the influence of the program.
2. Develop meaningful and actionable recommendations to improve program performance in delivering energy efficiency savings.

Evaluation objectives

The objectives of this effort were to:

1. Quantify first-year and lifecycle gross kWh, peak (highest demand) kW,[6] and therm savings by sampling domains (e.g., by PA, by subject area, and by lighting/non-lighting).
2. Calculate the ratio of evaluated savings to the savings claimed by Program Administrators, referred to as the gross realization rate (GRR), by sampling domains. GRR is calculated by comparing the energy savings evaluated (or realized) in the 2022 program year to the energy savings predicted before the implementation of the energy efficiency measures.
3. Provide analysis of the factors driving the GRR.
4. Recommend how GRRs can be improved.
5. Quantify the ratio of the program's evaluated net and gross savings[7] referred to as the net-to-gross ratio (NTGR), by sampling domains.
6. Identify the factors that characterize free-ridership and provide recommendations to reduce free-ridership. Free-ridership[8] occurs when participants would have installed the same equipment or technologies in the absence of the program. We refer to such participants as free-riders because they receive benefits from programs for actions they would have taken without the program.

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[5] Non-deemed savings refers to energy savings that are not predefined or pre-approved by regulators or program administrators.

[6] Peak kW refers to the highest level of power consumption or demand over a specific period, typically within a certain timeframe such as a day, month, or year.

[7] A factor representing net program load impacts divided by gross program load impacts that is applied to gross program load impacts to convert them into net program load impacts.

[8] Statewide Custom Project Guidance Document, version 1.4, pg. 39.

7. Identify gaps in the planned evaluation, measurement, and verification (EM&V) activities for custom programs and describe emerging evaluation issues to be addressed going forward.
8. Provide actionable recommendations to address gaps and improve programs and projects in the future.

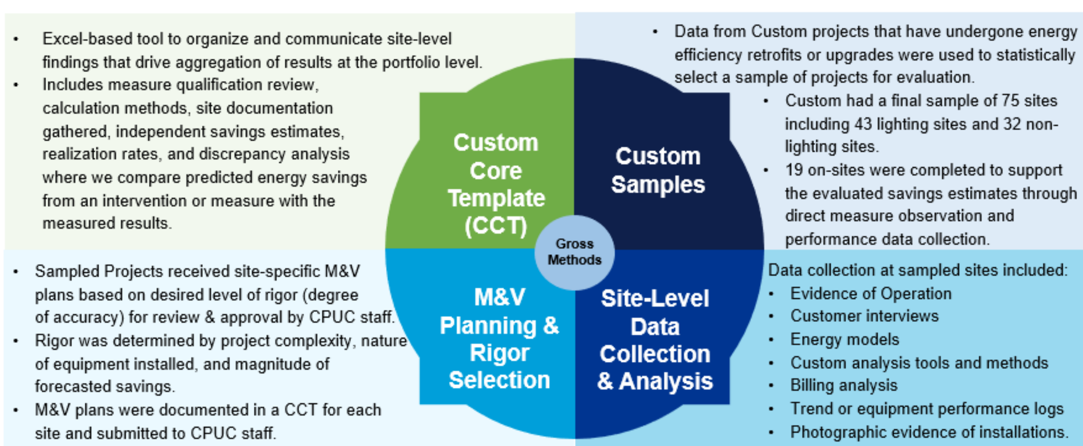
METHODOLOGY

DNV evaluated gross and net savings that the PAs claimed for Custom and Savings by Design[9] (SBD) projects installed in program year (PY) 2022, which are not separated in this summary but are presented separately throughout the body of the report. Our gross and net savings calculation methods are described in the final study work plan[10] and summarized below. This study adhered to International Performance Measurement and Verification Protocol (IPMVP)[11] and the California Evaluation Protocol[12] throughout its execution. Figure ES-1 shows the overall evaluation process.

Figure ES-1. CIAC gross and net savings methods PY2022

Gross methods

The following steps, in sequence, were key elements of our evaluation of gross savings methods: 1) sample design, 2) a site-specific evaluation via use of a Custom Core Template,[13] 3) extensive measurement and verification (M&V) planning, and 4) site-level data collection and analysis for sampled sites from each area of interest.



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[9] SBD is the non-residential new construction program. SBD savings are estimated via either a "Systems" or "Whole Building" approach. The Whole Building approach requires a program-approved energy simulation tool to estimate energy savings, while a typical Systems approach project can use simplified modeling.

[10] GROUP D Evaluation, Measurement, & Verification of Program Year 2022 commercial, Industrial, and Agriculture Custom Projects Work Plan, California Public Utilities Commission, September 30, 2023.

[11] IPMVP is a protocol that facilitates a common approach to measuring and verifying energy efficiency investments. IPMVP incorporates M&V best practices in a non-prescriptive framework that allows it to be applied flexibly based on a measure's application and the information available.

[12] The California Evaluation Protocol (CEP) is a set of guidelines and procedures developed by the California Public Utilities Commission (CPUC) for conducting evaluations of energy efficiency programs.

[13] DNV created an Excel-based Custom Core Template (CCT) to organize and communicate evaluation information for each claimed project in the sample. This spreadsheet was used to ensure a uniform and systematic approach to determining and communicating gross savings methods, calculations, and results.

Net methods

The net-to-gross assessment estimated the portion of gross energy savings attributable to the financial incentives or activities (e.g., audits, technical assistance) of an energy efficiency program. The **net-to-gross approach** used in this study is consistent with approaches used in previous Custom project attribution research in California. This approach is summarized below:

DNV completed 72 participant net-to-gross surveys. We used survey responses to collect information needed to calculate three component scores that made up the net-to-gross ratios for each project including:

- Two program attribution scores measured the **relative strength of program and non-program project drivers** on decision-making.
  - For the first program attribution score, the evaluation team asked program participants to rate the relative importance of a list of program project drivers (e.g., incentives, technical assistance, and assistance from utility key account reps) as well as a list of non-program project drivers (e.g., the age of the prior equipment, regulatory compliance, and the desire to improve product quality) on their decision to implement the energy-efficient measures. The team based the attribution score on the highest influence rating for a program project driver divided by the sum of the highest influence rating for a program project driver and the highest influence rating for a non-program driver.
  - For the second program attribution score , the study asked program participants to divide 10 points into two numbers with the first number representing the relative influence of all the program project drivers and the second number representing the relative influence of all the non-program project drivers.
- A third program attribution score measured **the likelihood of the participating customer installing program qualified equipment in the absence of the program**.

Net-to-gross ratios were calculated as the **average of these three program attribution scores**.

EVALUATED PROGRAM SAVINGS CLAIMS

This evaluation focused on the energy savings forecasted by the PAs. The forecasted savings in the CIAC study included **30,695 MWh first year electric** savings and **256,050 MWh** lifecycle energy savings in program year 2022. Total forecasted first year gas savings were 2,252 thousand therms and total forecasted lifecycle gas savings were 16,297 thousand therms. Of the 265 projects in the population, DNV sampled 75 projects to inform the gross evaluation and 72 projects to inform the net evaluation.

		First-year*			Lifecycle		
Group	Number of Projects	Forecasted savings (MWh)	Forecasted savings (MW)	Forecasted savings (thousand therm)	Forecasted savings (MWh)	Forecasted savings (MW)	Forecasted savings (thousand therm)
Electric	246	30,695	2.9	N/A	256,050	31.0	N/A
Natural Gas	19	N/A	N/A	2,252	N/A	N/A	16,297
Overall	265	30,695	2.9	2,252	256,050	31.0	16,297

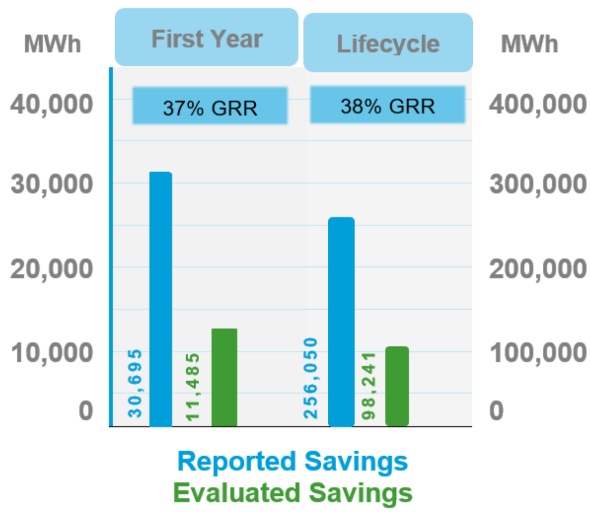
*Twenty-six projects are not in this summary as they represented less than 1% of program savings. These projects represent first-year savings of 114.8 MWh and negative 1.2 thousand therms (due to lighting interactive effects) and lifecycle savings of 564 MWh and negative 1.5 thousand therms. Lighting interactive effects refer to the changes in HVAC energy usage due to the installation of energy efficient lighting measures. These projects receive statewide realization rates by program in the gross and net savings analysis.

RESULTS

Gross savings results

The following graphics show the overall evaluated statewide electric and gas results and gross realization rates. Statewide refers to all PAs and represents the overall results for California.

Electric



Key electric gross findings

- Projects within the CIAC study in program year 2022 had an **evaluated first-year gross electric savings of 11,485 MWh** and **evaluated lifecycle gross electric savings of 98,241 MWh** with statewide GRRs of 37% and 38%, respectively.
- Key drivers of the electric first-year and lifecycle realization rates were **ineligible measures** and the use of **inappropriate baselines,** which had a -20% and -22% impact on the GRR, respectively.

Key natural gas gross findings

- Projects within the CIAC study in program year 2022 had an **evaluated first-year gross natural gas savings of 1,014 thousand therms** and **evaluated lifecycle gross natural gas savings of 3,056 thousand therms** with statewide GRRs of 45% and 19%, respectively.
- Key drivers of the natural gas first-year and lifecycle realization rates were **inappropriate baselines** and adjustments to **calculation methods** (e.g., changes in model platform used) which had a -15% and -37% impact on the GRR, respectively.

Natural Gas

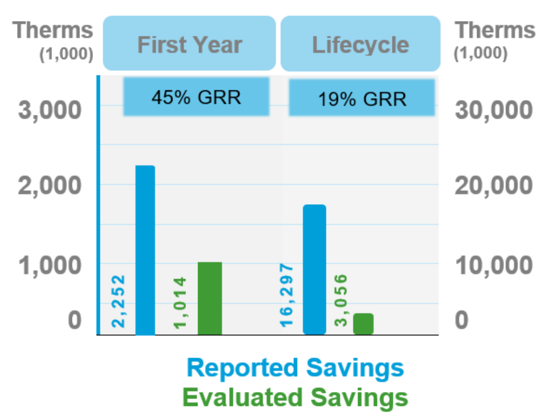


Table ES-1 presents the electric first-year and lifecycle evaluated energy and demand gross savings and precisions, both statewide and by PA. PG&E, representing approximately 83% of forecasted first year MWh savings, is the primary influence on statewide performance. The statewide precisions are worse than targeted, due to a relatively high number of large savings projects with gross realization rates of 0% (no savings) and two other large sites with evaluated savings nearly double the forecasted savings. This introduced high variability, resulting in an increase in the overall relative precision.

Table ES-1. Electric first-year and lifecycle evaluated gross energy savings by PA[14]

Program Administrator	First-year savings				Lifecycle savings			
	Forecasted	Evaluated Gross	GRR	RP%*	Forecasted	Evaluated Gross	GRR	RP%*
Energy (MWh)								
MCE	4,078	1,147	28%	±67%	20,102	6,289	31%	±67%
PG&E	25,328	10,767	43%	±17%	226,706	88,750	39%	±16%
SDG&E	1,289	-429	-33%	±399%	9,241	3,203	35%	±141%
Statewide	30,695	11,485	37%	±23%	256,050	98,241	38%	±16%
Demand (MW)								
MCE	0.1	0.06	45%	±28%	1.4	0.3	25%	±53%
PG&E	2.6	1.3	48%	±20%	27.6	11.9	43%	±24%
SDG&E	0.1	0.1	94%	±3%	2.1	2.2	102%	±2%
Statewide	2.9	1.5	50%	±17%	31.0	14.4	46%	±20%

** Relative precision at the 90% confidence level.*

A discussion of the drivers of each PA's electric realization rates is provided below.

- **MCE**, representing approximately 13% of forecasted first-year MWh, had a first-year MWh GRR of 28% with a relative precision of ±67% and a lifecycle MWh GRR of 31% at ±67%. Most of MCE's savings were from lighting projects, which found that, for seven projects, savings values entered into the CEDARS system were incorrect when compared to project documentation and the evaluation findings. This **administrative error**, in addition to **differences in evaluated operating conditions when compared to claimed**, were the primary drivers of the GRR.
- **PG&E**, representing approximately 83% of forecasted FY MWh savings, had a first-year MWh GRR of 43% with a relative precision of ±17% and a lifecycle MWh GRR of 39% ±16%. PG&E's GRRs were largely impacted by **differences in evaluated operating conditions and calculation methods.** Two projects that represented approximately 21% of PG&Es forecasted savings included one site with no gross savings and one with a 16% gross first year realization rate, and were the primary drivers of the first-year savings realization rate. PG&E's decrease in lifecycle GRR compared to the first-year GRR was caused by projects with lower evaluated EUL and RUL than the forecasted value.
- **SDG&E**, representing approximately 4% of forecasted MWh first-year savings, had a first-year MWh GRR of -33% with a relative precision of ±399% and a lifecycle MWh GRR of 35% ±141%. SDG&E's negative GRR is driven by one project. This project is a High Opportunity Program and Project (HOPP) that included three measures with forecasted savings. The evaluators **visited this project site and found that these measures were either not operational or irrelevant to system operations, resulting in no savings**. As a result of the PY2022 evaluation, previously evaluated savings from 2020/2021 for this project were reversed, resulting in negative savings for this program period in order to correct the over-attribution in PY2020/2021.

Table ES-2 presents the gas first-year and lifecycle evaluated therm gross savings and precisions statewide and by PA. The statewide precision around first-year savings is very good at ±9%, while the precision is worse (±22%) around lifecycle savings. The poorer lifecycle precision is due to a project with an evaluated savings that was multiple orders of magnitude higher than forecasted, which introduced high variability, resulting in an increase in the overall relative precision. The SCG precision is very good due to the inclusion of their two largest sites in our sample, which represented most of their forecasted savings.

[14] Electric savings and gas first-year and lifecycle savings by program administrator are presented in the tables below. Note that a small subset of program activity (<1%) was not included in the sample. The results calculated from the sample at the program/measure level were applied to this subset of activity to determine total impacts.

Table ES-2. Natural gas first-year and lifecycle-evaluated gross savings by PA

Program Administrator	First-year savings				Lifecycle savings			
	Forecasted therms (1,000)	Evaluated gross therms (1,000)	GRR	RP%*	Forecasted therms (1,000)	Evaluated gross therms (1,000)	GRR	RP%*
MCE[15]	-10	-4	38%	±35%	-132	-23	17%	±61%
PG&E	916	-211	-23%	±38%	12,259	-1,256	-10%	±19%
SCG	1,257	1,193	95%	±0%	3,861	3,611	94%	±0%
SDG&E	89	37	41%	±86%	309	724	234%	±87%
Statewide	2,252	1,014	45%	±9%	16,297	3,056	19%	±22%

** Relative precision at the 90% confidence level.*

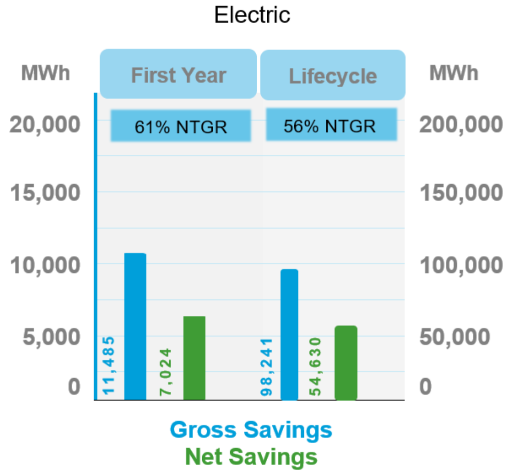
A discussion of the drivers of each PA's natural gas realization rates is provided below.

- **PG&E**, representing approximately 41% of forecasted statewide first-year therm savings, had a first-year GRR of -24% with a relative precision of ±38%. The negative realization rate is being driven by (a) two non-lighting projects that represented 72% of the total lifecycle forecasted therms determined to **have negative savings, one due to an inappropriate baseline and the other due to a difference in calculation methods**, and (b) lighting projects, which account for increased gas usage when installing energy efficient lighting measures. **Among the 24 lighting-only projects in the sample, 11 had evaluated negative therm savings**.
- **SCG**, representing approximately 56% of forecasted first-year statewide therm savings, had a first-year GRR of 95% with a relative precision of ±0%. The **evaluation conducted a census on SCG projects**, which accounts for the relative precision of ±0%. Of the two projects evaluated (which represented a census for SCG), **one had a GRR of 96%,** while **the other had a GRR of 38%**. The project with the higher GRR represented 99% of the evaluated savings for SCG.
- **SDG&E**, representing approximately 4% of forecasted first-year therm savings, had a first-year GRR of 41% with a relative precision of ±86% and a lifecycle GRR of 234% ±87%. Of the three projects with claimed savings, one project is driving the GRR. For this site, DNV's application **of a more appropriate calculation approach** resulted in a project level GRR of 59,494%. This was primarily driven by a large savings increase of roughly two orders of magnitude: 130 therms of modeled savings to 19,399 therms. This first-year savings increase was compounded by an increase in the EUL from 15 years to 20 years in the lifecycle gross savings. These first-year and lifecycle savings, in combination with the domains, project weighting, and expansion to the population savings totals, produced this difference in estimates.

Net savings results

The CIAC study found the evaluated first-year net electric savings was 7,024 MWh with a statewide NTGR of 61% and the evaluated first-year net gas savings was 768 thousand therms with an NTGR of 76%. The electric and gas statewide lifecycle NTGRs observed in this study are higher than previous evaluations of this program since 2019. Based on the data collected in this and previous studies, the cause of the higher values may be due to increased likelihood to value incentives, PA recommendations, and program marketing information in the participant installation decision. There was also some evidence that the program was doing a better job of screening out projects where equipment age or previous experience with the measure were important project drivers.

[15] MCE has negative natural gas savings due to the interactive effects of lighting measures.



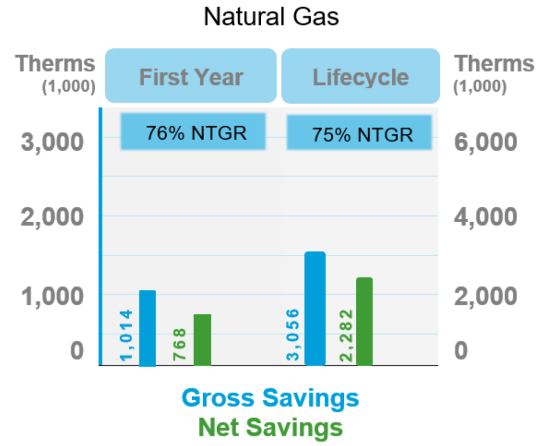


Table ES-3 shows the first-year and lifecycle electric net savings broken down by Program Administrator. CIAC had an overall first-year electric energy NTGR of 61% with a relative precision of ±7%, with a lifecycle NTGR of 56% with a relative precision of ±9%. The negative first-year net savings for SDG&E is due to the negative gross savings for this PA as noted earlier in the report. The SDG&E net savings in the first year turn positive in the lifecycle period because the EUL of the negative savings project ends and longer-lived projects with positive savings reverse the overall direction of the savings.

This 56% lifecycle electric NTGR was up significantly from the 39% NTGR estimated for PY2021 and the 34% estimated for PY2020. While the evaluation team could not identify any major drivers for this NTGR increase, it theorized it could be the cumulative impact of several smaller drivers including evidence of better project screening practices, a reduction in the number of SBD projects in the population (which historically have had much lower NTGRs than Custom projects), and a large representation in the sample of lighting projects (which historically have had higher NTGRs than non-lighting projects) .

Table ES-3. Electric first-year and lifecycle-evaluated net savings by PA

Program Administrator	First-year net savings			Lifecycle net savings		
	MWh	NTGR	RP%*	MWh	NTGR	RP%*
			Energy (MWh)			
MCE	680	59%	±8%	3,476	55%	±15%
PG&E	6,677	62%	±8%	50,109	56%	±10%
SDG&E	-212	50%	±22%	1,613	50%	±22%
Statewide	7,024	61%	±7%	54,630	56%	±9%
			Demand (MW)			
MCE	0.04	60%	±5%	0.2	57%	±12%
PG&E	1	64%	±5%	7	57%	±7%
SDG&E	0.1	54%	±17%	1	55%	±17%
Statewide	0.9	63%	±5%	8.2	57%	±7%

** Relative precision at the 90% confidence level.*
Table note: The domain (PA) NTGRs were calculated with a blend of embedded and non-embedded sample. These NTGRs were applied to the evaluated gross savings totals to derive the values in this table. Due to this expansion process, the total of the domain estimates does not equal the statewide savings.

Table ES-4 shows the first-year and lifecycle natural gas net savings broken down by Program Administrator. The first-year NTGR for gas projects was 76% with a relative precision of better than ±1% and a lifecycle NTGR of 75% with a relative precision of better than ±1%. As noted for electric NTGRs earlier, these are the highest NTGRs observed for this program in the last several years. The main driver of the higher program-level NTGRs was a single SCG project that had a high NTGR while also accounting for the bulk of the program gas savings.

Table ES-4. Natural gas first-year and lifecycle-evaluated net savings by PA

Program administrator	First-year savings			Lifecycle savings		
	1,000 therms	NTGR	RP%*	1,000 therms	NTGR	RP%*
PG&E	-104	49%	±8%	-562	45%	±27%
SCG	924	78%	±0%	2,798	78%	±0%
SDG&E	20	54%	±2%	434	60%	±3%
Statewide	768	76%	±0.1%	2,282	75%	±0.5%

** Relative precision at the 90% confidence level.*

Table note: The domain (PA) NTGRs were calculated with a blend of embedded and non-embedded sample. These NTGRs were applied to the evaluated gross savings totals to derive the values in this table. Due to this expansion process, the total of the domain estimates does not equal the statewide savings.

CONCLUSIONS & RECOMMENDATIONS

The key conclusions and recommendations presented here were developed from all impact evaluation activities.

The statewide lifecycle electric GRR in this study is 38%, which is lower than in 2020/2021 (48%) and 2019 (48%). This is due to 16 sites that had zero savings in the current study. The statewide lifecycle gas GRR in this study is 19%, which is significantly lower than in 2020/2021 (89%) and 2019 (40%). It should be noted that the 2020/2021 evaluated GRR of 89% included a large savings project that accounted for over 90% of all gas savings. With this project removed, the PY2020/2021 GRR was 29%. The lower GRR for lifecycle gas was due to five gas sampled sites that represented 72% of overall lifecycle gas forecasted gas savings, in which two had negative savings and three had zero savings.

The overall lifecycle NTGR for electric savings is 56%, while the overall lifecycle NTGR for gas is 75%.[16] These are the highest NTGRs observed among evaluations for this program.

The following conclusions and recommendations focus on qualitative items, such as project documentation and recruitment for all research areas. We provide these recommendations to inform the PAs about items that impact evaluation timelines and outreach efforts, so the PAs can streamline evaluation requests and fulfilments in future years. Conclusions and recommendations 1 through 7 directly impacted the evaluated results followed by qualitative conclusions and recommendations.

Conclusion 1. This study encountered instances of incorrectly applied MATs, such as RCx projects, which were documented as NR. These projects did use the correct EULs but did not have proper MATs applied, which should be flagged during project file review or engineering quality control. These are a subset of 20 occurrences of inappropriate baseline applications observed in this study. Inappropriate baselines resulted in a reduction of 22% of first-year electric savings and 15% of first-year gas savings.

Recommendation 1. PAs should apply appropriate MATs to each claim. MATs are defined in the Statewide Custom Project Guidance Document version 1.4[17] and should be used when determining the appropriate MAT.

Conclusion 2. Installed measures must exceed baseline energy performance. Installed measures were not always above code baseline efficiency. Measures are required to be more energy efficient than the applicable code or standard practice baseline. Programs shall not include to-code measures that do not exceed code except for an NMEC or HOPPs compliant framework.

[16] Previous gas NTGRs were 54% in 2015, 48% in 2019, and 14% in 2020/2021. Previous electric NTGRs were 54% in 2015, 47% in 2019, 34% in 2020, and 39% in 2021.
[17] https://file.ac/OEr-2p-bk3A/

Recommendation 2. The PA should provide all necessary information to show that installed measures exceed baseline energy performance and if permitting document is one of them then that should be submitted to the CPUC as part of the package. Any measure technology that matches a DEER definition for a code baseline is considered a to-code measure (i.e., has zero savings). PAs should also work with third party (3P) implementers to ensure that they are aware of CPUC requirements, including baseline selection, incremental cost, and eligibility requirements.

Conclusion 3. This study encountered incorrect or outdated baseline information. Consistent with the PY2020/2021 evaluation, many sources used for baseline information were based on old and/or inaccurate information.

Recommendation 3. PAs should ensure appropriate baselines and SPs are being used at the time of project approval. If available SP studies are used, the PAs should ensure the studies are less than five years old at the time of project application and approval. Per Energy Efficiency Industry Standard Practice (ISP) Guidance document version 3.1,[18] market studies should be less than five years old. If an SP is greater than five years old, the PA should reassess the SP for continued applicability or replace with an updated standard practice.

Conclusion 4. Accelerated replacement baselines were overturned to normal replacement for a high fraction of the lighting-only projects sampled for evaluation. Specifically, PAs claimed 39 projects accelerated replacement. Based on the customer responses, the baseline was determined to be normal replacement for 15 of these (38%) projects.

Recommendation 4. PAs should complete the accelerated replacement questionnaire for all accelerated replacement projects to ensure supporting evidence is documented as defined in Resolution E:5115[19]. This can be accomplished by probing participants to verify baselines qualify as accelerated replacement before claiming savings. Projects where equipment is not providing the intended service, or where the customer was already planning a lighting project in the very near future, should not be claimed as "Accelerated Replacement."

Conclusion 5. Project extensions are not always documented as required in the customer agreement. Projects were found to have been installed past the approved installation date without contract extensions and/or lacked continuing measurement requirements in the customer agreement.

Recommendation 5. PAs should ensure that projects are installed before the approved installation date and savings are claimed within the approved installation year. If projects cannot be installed before the approved installation date, provide written extensions on an annual basis before the expiration of the agreement. At this time, the PAs should also ensure that equipment has not been ordered by seeking evidence such as the copy of dated purchase order or require invoices that show the date of purchase order. PAs should formalize the customer agreement extension process to ensure that proper procedures are followed when extensions are granted.

Conclusion 6. CEDARS data entry errors can result in incorrect savings claims. The evaluation team found that for seven projects, savings values entered in the CEDARS system were incorrect when compared to project documentation and the evaluation findings.

Recommendation 6. PAs should conduct either manual or automated quality control processes on CEDARS inputs prior to posting claims. This should include cross verification of total savings against PA tracking systems and the CEDARS system. If discrepancies are found, the cause should be identified and rectified in a timely manner, prior to finalization of program year submissions.

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[18] CPUC. "Custom Projects Review Guidance Documents." https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/energy-efficiency/custom-projects-review-guidance-documents

[19] https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M366/K381/366381636.PDF

Conclusion 7. The number of custom projects decreased substantially from those observed in the 2020/2021 program years. The PY2022 CIAC program had fewer than 300 projects, compared to more than 2,000 for the PY2020-2021 CIAC program.

Recommendation 7. Explore reasons for the drop-in custom project activity from the previous evaluation period. Understanding the cause of the drop-in activity may provide insights into program changes that might make the custom offering more appealing, customer needs that are not being met with the current program design, or marketplace changes that are making the program less valuable in helping customers pursue energy efficiency. The CPUC staff s planning on examining this decline in project activity as part of the evaluation of the CPR process.

Conclusions and recommendations 8 through 10 are qualitative in nature and did not directly impact the evaluated results. They are provided to improve program operations and customer value.

Conclusion 8. PY2022 custom program customers were unaware of evaluation participation requirements. Evaluators encountered a resistance to customer participation in the evaluation effort: Some customers asked for evidence that they had signed documentation that included a requirement to cooperate with evaluators under the terms and conditions for program participation; others agreed to participate only after their account representative intervened; yet others contacted the implementation contractor, and subsequently refused outright after hearing from the contractor that this was not a requirement. Evaluators also found a number of customers unaware that the cost reduction for their project was due to their participation in an energy efficiency program.

Recommendation 8. PAs should ensure implementation contractors, especially those who work for direct installation programs, are making participating customers aware of their program participation and their obligation to participate in evaluations as needed. Contractors should understand that they must (1) inform the customers that their project receives a public funds rebate, (2) are fully aware that customers might be required to take part in evaluation efforts, and reinforce this with customers if/when they reach out to them to confirm program requirements, and (3) obtain customer signature on Terms and Conditions documents, and submit these as part of the documentation package for each project.

Conclusion 9. Some PAs did not submit custom project applications on a bi-monthly basis for CPR selection and review in accordance with SB1131 or did not submit project applications in a timely manner. The evaluation found multiple occurrences where projects were not submitted to CMPA or were submitted late. Future program requirements may deem projects not submitted in accordance with SB1131 as ineligible if selected for evaluation.

Recommendation 9. PAs must submit signed agreements to the bi-monthly CPR list on the first and third Monday of each month. Once submitted, the CPR team may select projects from the weekly list for Custom Project Review. If selected, the project moves through the CPR process in accordance with SB1131. If not selected, the project is waived and can commence implementation.

Conclusion 10. This evaluation encountered discrepancies between the tracking data and the reported savings in the PA documentation. In five cases, tracking data discrepancies were observed resulting in difficulty tracing savings from the project documentation through to the tracking system.

Recommendation 10. The PAs should thoroughly document project files and associated calculations that align with the tracking data before sending files to the evaluators. If there are notable discrepancies, the PAs should point them out in the files and provide explanation for the discrepancies.

2 INTRODUCTION

This report presents the evaluation results for the California Program Administrators' (PA) Custom Industrial, Agricultural, and Commercial (CIAC) programs for the program year 2022 (PY2022). This evaluation effort was guided by the CIAC final work plan dated September 9, 2023.[20]

2.1 Background

The CIAC study's overall purpose was to evaluate energy and demand savings for CIAC projects installed in PY2022. This impact evaluation quantified evaluated gross and net first-year and lifecycle electric and gas energy savings and peak demand reduction. The study presents recommendations for improving program-delivery quality control, maintenance of clear and complete project documentation, and submission of appropriate savings claims consistent with project documentation. This evaluation also assessed the PAs' project-specific documentation of calculation methods, baselines, and savings parameters used to forecast savings.

2.2 Evaluation objectives

The six primary objectives of this study were to:

1. Develop first-year and lifecycle evaluated net and gross savings for the Custom and SBD savings claims at a high level of precision.
2. Determine reasons for differences between evaluated (ex-post) and forecasted (ex-ante) savings; identify issues with respect to reported savings estimation methods, inputs, and program procedures; and make recommendations to improve the savings estimates and realization rates of the evaluated programs.
3. Provide results and data that will assist with updating workpapers/measure packages and the Database for Energy Efficiency Resources (DEER) values.
4. Estimate the proportion of program-installed measures and actions that would have been implemented absent program participation (free-ridership), determine the factors that characterize free-ridership, and, as necessary, provide recommendations on how free-ridership can be reduced.
5. Provide timely feedback to the California Public Utilities Commission (CPUC), PAs, and other stakeholders on the evaluation research study to facilitate timely program improvements and support future program design efforts.
6. Provide recommendations to improve program performance in delivering energy efficiency savings.

2.3 CPUC policies and guidance

When designing and implementing this evaluation, we (DNV, the evaluation team) considered the following CPUC policies and guidance as well as the codes and regulations that were in effect at the time of project approval:

- CPUC Energy Efficiency Policy and Procedures Manual Version 6
- Statewide Custom Project Guidance Document v. 1.4
- Utility Statewide Custom Policy and Procedures Manuals
- 2020 Savings by Design Participant Handbook, policies and procedures for participation in the statewide SBD program
- Savings By Design Baseline Guidance Document
- PA-specific program policy and procedures manuals
- Energy Efficiency Industry Standard Practice (ISP) Guidance v. 3.1
- 2016 Savings by Design Healthcare Baseline Procedures

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[20] CIAC PY2022 Evaluation Final Work Plan: https://pda.energydataweb.com/#!/documents/3867/view

- Assigned Commissioner and ALJ Ruling Regarding High Opportunity Energy Efficiency Programs or Projects ALJ Ruling on Certain Measurement and Verification Issues, including for Third-Party Programs
- Title 20 and 24 requirements in place when projects were permitted
- CPUC policy papers and state-government memos addressing topics such as the savings for sites using non-Investor-Owned Utilities (IOU) fuel sources
- CPUC resolution E5115 adopting minimum evidence requirements to support custom projects accelerated replacement measure type
- CPUC resolution E-4867 approving the DEER updates for 2020
- CPUC resolution E-4952 revising DEER update for 2020
- CPUC resolution E-4818 affecting assignment of project baselines
- Dispositions of reviews of custom projects by CPUC staff
- CPUC resolution E-4939 affecting preponderance-of-evidence requirements for accelerated-replacement projects and definition of small-business customers
- New construction permit requirements for the PAs as specified in SB-1414
- Fuel Substitution Technical Guidance for Energy Efficiency V2.0
- CPUC D.19-08-009 Fuel Substitution Decision[21]
- Project Ineligibility Table from the 2020-2021 CIAC Work Plan
- Evaluation Guidance Questions and Responses from the 2020-2021 CIAC Work Plan
- Assigned Commissioner and Administrative Law Judge's Ruling Regarding High Opportunity Energy Efficiency Programs (HOPPS) Or Projects, Rulemaking 13-11-005 (Filed November 14, 2013)
- Assembly Bill (AB) 802
- Other CPUC decisions and guidance documents as appropriate

[21] D.19-08-009 adopted the fuel substitution test and ordered the creation of this fuel substitution guidance document. D.19-08-009 provides direction on the fuel substitution test, fuel substitution measure eligibility, and utility credits for savings claims.

3 METHODOLOGY

Most of the methodology for this evaluation is described in the published final work plan.[22] This section documents the final methods DNV used, including the planned sample design, achieved sample sizes, gross savings, measurement and verification (M&V) activities, net savings approach, and final expansion procedures. The evaluation followed the International Performance Measurement and Verification Protocol (IPMVP) and the California Evaluation Protocol throughout its execution.

To better fulfill the evaluation objectives listed in Section 2.2, DNV collected information on 75 gross sample points and 72 net sample points.[23] The gross site evaluation was based on on-site verification, phone interviews, virtual data collection, and extensive analysis. The net evaluation used an interview-based approach to determine net-to-gross (NTG) scores. Both gross and net evaluation results are presented in Section 4 of this report.

3.1 Sample designs

3.1.1 Gross and net savings sample design overview

A sample design and data collection memo[24] delivered to the CPUC and PAs provided details on the proposed sample design to evaluate gross and net savings, detailed sample domains, target completes, and target precisions.[25] In July 2023, DNV obtained final project tracking data for all commercial and industrial (C&I) programs that included non-deemed project savings claims from CEDARS. The sample design for Wave 1 used final Energy Division (ED) tracking data for Q1–Q3 of PY2022. This approach expedited the study by estimating the total sample needed to adequately represent Q4 of PY2022 before the final claims were available. The populations presented in this report are based on the claims from the final ED tracking data for PY2022. We finalized the population after performing data cleaning to remove placeholder claims, mis-assigned claims, claims associated with a prior year installation[26] (consistent with CPUC precedent), and assignment of claims to other program evaluations.

The sample design aggregated activity to a project level and did not include claims with negative savings (consistent with prior years' evaluations) that are generally either bulk adjustments for prior year claims or interactive effects from positive savings for the other fuel, e.g., heating penalty when retrofitting to LED lighting. Both positive and negative savings were included in the overall gross realization rates (GRRs). The sample design used error ratios available from previous cycles of California C&I evaluations to determine the sample size for most key domains. The sample design used forecasted savings calculated by removing the default GRRs[27] that had been applied by the system in calculating the savings reported in the ED tracking data. The sample design stratified by MMBtu savings to provide a consistent unit of measure for projects that can have both electric and gas savings. We summarize the final approved sample design parameters in Table 3-1.

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[22] CIAC PY2022 Evaluation Final Work Plan, 9/20/2023, DNV: https://pda.energydataweb.com/#!/documents/3867/view

[23] A sample point is defined as an individual project installed at a specific site.

[24] https://pda.energydataweb.com/api/downloads/3867/CIAC%20PY2022%20Evaluation%20Sample%20Design%20Memo.pdf

[25] Sample Design and Data Collection: https://pda.energydataweb.com/api/downloads/3867/CIAC%20PY2022%20Evaluation%20Sample%20Design%20Memo.pdf

[26] Except projects installed in Q4 of 2021 that had a continuing M&V requirement

[27] CPUC, "Default Custom Measure Gross Realization Rates,": D1107030 Attachments A-B (ca.gov)

Table 3-1. CIAC sample design assumptions and approach

Parameter	Description (PY2022)
Population	Tracking data set for the program year, aggregated at the application (project ID) level Q1-Q3 final Q4 final
Explicit sampling stratum	PA, Size, Measure group, Fuel type Q1-Q3 vs Q4
Gross sample allocation	75 projects for the combined waves, allocated for best overall precision while targeting 90/10 results by fuel type and 90/10 overall (MMBtu)
NTGR sample allocation	Separate sample allocation, starting by attempting NTGR surveys for all projects in the gross impact sample. 150 total projects (75 embedded with the gross sample, 74 non-embedded). Allocated for best overall precision
Sample design approach	Stratified ratio estimation
Target parameters	GRR, NTGR
Analysis domains	PA, Fuel, Measure Group (Lighting vs. Non-Lighting)
Error ratios	By PA and fuel based on historical Custom and Industrial results from three prior CA evaluation cycles
Projected precision at 90% confidence (based on current error ratio assumptions)	CIAC PY2022 Gross MMBtu savings by energy unit (electric): 10% Gross MMBtu savings by energy unit (gas): 15% NTGR by electric fuel type: 10% NTGR by gas fuel type: 10%
Savings size stratification	Custom – up to 3 levels based on savings, depending on the number of samples in the cell
Contingency and back-up sample	Gross impact sample: 50% initial over-sample for a primary sample to account for response rates. All gross impact primary samples are included plus additional ones as needed. The remaining projects are pre-sorted into a random selection sequence for each non-census-attempt sampling cell to produce additional backup cases as needed NTGR sample: all participants were included in this sample (census) to achieve targeted response rates.

3.1.2 Gross sample completions and response rates

Table 3-2 show the population counts, sample design quotas, and final sample achieved for key analysis dimensions. Overall, 22% of electric and 67%[28] of gas projects in the primary sample design were recruited. The electric sample design targeted ±4% relative precision for lifecycle gross energy impacts overall and the final achieved relative precision for electric overall is ±16%. The gas sample design (as shown) targeted ±2.5% relative precision lifecycle energy impacts and the final achieved relative precision for gas overall is ±22%. The higher-than-expected relative precision at the statewide level is being driven by results in the custom subject area. DNV found that a relatively high number of very large savings projects had 0% gross realization rates. For example, of the top 10 forecasted savings projects, which represent approximately 16.5 million kWh of claimed savings, the evaluated savings associated with those projects was found to be approximately 3.4 million kWh, resulting in about a 20% gross savings realization rate. Gross realization rates within these 10 projects ranged from 0% to

[28] For comparison purposes, the PY2020/2021 evaluation capture 5% of the electric population and 33% of the gas population.

105%. This high variability relative to historic norms, especially among the largest forecasted savings projects, increases the actual error ratios and overall relative precision.

Table 3-2. Overall gross sample response rate by fuel and key analysis dimensions

Dimension	Electric				Natural gas			
	Population (N)	Sample design quota	Final sample (n)	% complete	Population (N)	Sample design quota	Final sample (n)	% complete
Program Administrator								
MCE	99	20	20	100%	0	0	0	
PGE	138	36	35	100%	13	11	11	100%
RCEA	21	0	0		0	0	0	
SCG	2	0	0		5	2	2	100%
SDG&E	9	4	4	100%	6	3	3	100%
Statewide	**269**	**60**	**59**		**24**	**16**	**16**	
Measure type								
Lighting only	238	39	39	100%	1	1	1	100%
Other	31	21	20	100%	23	15	15	100%
Total	**269**	**60**	**59**	100%	**24**	**16**	**16**	100%

3.1.3 Net sample completions and response rates

We targeted NTG data collection to all sites in the gross sample. Table 3-3 shows the sample design quotas and precisions targeted (the same as the gross sample design). Additional surveys with participants outside of those included in the gross evaluation sample were performed in our effort to fill all sample quotas. A total of 72 completed surveys were used in the NTG results. Of these 72 surveyed projects, 39 of those were also part of the final gross sample (i.e., embedded). Of the 39 embedded projects, 35 had attributable savings associated with them (i.e., non-zero saver projects). DNV attempted a census of all embedded sites, and exhausted all avenues of recruitment, which included, PA involvement and multiple outreach attempts.

The table shows that for electric savings, the final net sample achieved 72 sites exceeding the sample design quota of 68 sites.[29] However, for the natural gas sites, only 47% of the sample design quota was completed.

[29] As discussed in the Net Recruitment subsection of Section 3.2.1.2, the evaluation team had an original sample goal of 150 sites but this was not based on any statistical precision targets but was more of a “stretch goal” to increase the possible number of HTR sites in the net sample.

Table 3-3. Overall net sample response rate by fuel and key analysis dimensions

Dimension	Electric				Natural gas			
	Population (N)	Sample design quota	Final sample (n)	% complete	Population (N)	Sample design quota	Final sample (n)	% complete
Program Administrator								
MCE	99	29	29	100%	0	0	0	
PGE	138	35	39	111%	13	11	2	18%
RCEA	21	0	0		0	0	0	
SCG	2	0	0		5	2	1	50%
SDG&E	9	4	3	75%	6	4	5	125%
Statewide	**269**	**68**	**71**		**24**	**17**	**8**	
Measure type								
Lighting only	238	58	60	103%	1	1	0	0%
Other	31	10	11	110%	23	16	8	50%
Total	**269**	**68**	**71**	**104%**	**24**	**17**	**8**	**47%**

3.1.4 Expansion methods

This section presents the methodology used to expand the sample results to the population to calculate program-level estimates of gross realization and the net-to-gross ratios (NTGRs).

Stratified ratio estimation was used to calculate separate ratios for each domain of analysis, which were implementation PA, program, and measure group (lighting only and all other measures). The gross realization rate was calculated as the weighted evaluated savings divided by the weighted tracking forecasted gross savings. For the NTGR for embedded sites for which both gross and net analyses were conducted, the denominator in the ratio expansion was the evaluated gross savings for the domain. This embedded approach for the net expansion was used to leverage the additional information that was collected in the gross analysis to calculate the net savings. After the estimation of project-level electric and/or gas impacts, the sampling weights were developed to expand the sample results to the population. The sampling weights reflect the sample stratification and population counts and completed sample counts.

3.2 Gross savings methods

3.2.1 Overall methods overview

This section describes the approach to evaluating gross savings. Our gross savings approach sought to maintain consistency with previous evaluation study methodologies. Our efforts relied on on-site verification, virtual verification, and phone surveys to confirm facility- and measure-level operation along with other virtual data collection techniques. Figure 3-1 shows three core aspects of the methods used across our evaluation, followed by a more detailed discussion of the methods used in our evaluation.

Figure 3-1. Custom evaluation approach

During the evaluation process, we determined **appropriate baselines** based on preponderance of evidence of program influence, relevant building code, program rules, CPUC policy requirements, and industry standards. When necessary, we performed a "mini ISP" study to support evaluated baselines.

Through **discrepancy analysis**, we assessed the reasons why variances were found between the forecasted and evaluated savings for each sampled project. The site-level discrepancy assessment shows the primary drivers of the realization rates.

To ensure **quality control**, senior engineers worked with lead engineers for review, verification, and approval stages before site-specific report submission.

3.2.1.1 Custom Core Template (CCT) and M&V plans

We leveraged the previously created Excel-based Custom Core Template (CCT) to organize and communicate evaluation information for each claimed project in the sample. The CCT served as the final site-specific evaluated savings deliverable and was the common source for reference material that engineers used to create M&V plans and document data collected in developing estimates of impacts. Critically, the CCT guided and captured the determination of whether measures were eligible or ineligible. We determined project eligibility in the CCT based on CPUC guidelines before developing full-fledged customized M&V plans. The determination of eligibility required an assessment of compliance with the CPUC decisions, rulings, and policies such as the Statewide custom program requirements and program-specific requirements.[30] We reviewed sites determined as ineligible with the CPUC and PAs as appropriate before removing their savings from the evaluation.

The CCT stored claim information downloaded from the tracking database about organized M&V activities, savings calculation methodologies, supplemental data, energy model references, site visit documentation, and realization rate determination in a common format shareable as site-level deliverables. The CCT ensured we followed CPUC guidelines and consistently developed and systematically followed best practices for pre-implementation review/evaluation. It also facilitated data sharing between DNV's CPR[31] team and the larger DNV team when a CPR site was selected for evaluation. We assigned projects and their accompanying CCTs to lead engineers based on subject area, measure category, and team member experience and specialty. We assigned a senior engineer to each sample project to ensure quality throughout the CCT-driven process.

We embedded site-level M&V plans in the CCT to maintain and store all available information on a given project in a single, easily accessible location. These plans served as the roadmap to determining the evaluated estimate of savings for a site. Engineers followed each M&V plan to document site visits, data collection, and methodology for estimating savings (and to ensure realization rates). The M&V plans allowed DNV engineers to validate key project information preliminarily determined from project files, such as baseline, eligibility, fuel substitution, non-IOU fuel source, data availability, and engineering methods. The M&V plan included a section to document applicant reported engineering methods to determine whether the provided templates could be repurposed for evaluation, or if the evaluators required a custom analysis template. The M&V template also fully documented the engineer's site-level activities and data gathering (e.g., which facility representatives were interviewed, what data was requested and received). Senior engineers reviewed each plan to maintain the quality standards of typical M&V procedures and policy requirements. Through a review of project documentation, we assessed M&V rigor as a key part of M&V planning, taking into consideration forecasted savings, end-use type, and the complexity of the project.

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[30] The Statewide Custom Project Guidance Document (https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/energy-efficiency/custom-projects-review-guidance-documents), program-specific manuals, Statewide custom program and policy manual, various CPUC decisions and resolutions, CPUC EE Policy Manual, CPUC guidance, CPR directives, are some of the resources DNV intends to use to determine project eligibility.

[31] Custom Project Review (CPR) refers to the process of selecting projects for further review of eligibility, baseline, program influence, and savings approaches used for projects submitted in a given program year.

3.2.1.2 Recruitment and data collection

We recruited sampled customers to schedule a site contact interview and to inform any modifications needed to the M&V plan before more formal data collection. For a selection of customers, we conducted on-site verification. The PAs assisted these efforts in various ways, including providing accurate customer contact information, providing introductory correspondence, and/or contacting the participant to encourage them to participate in evaluation activities (when requested by the evaluation team), including both NTG and gross surveys and verifications.

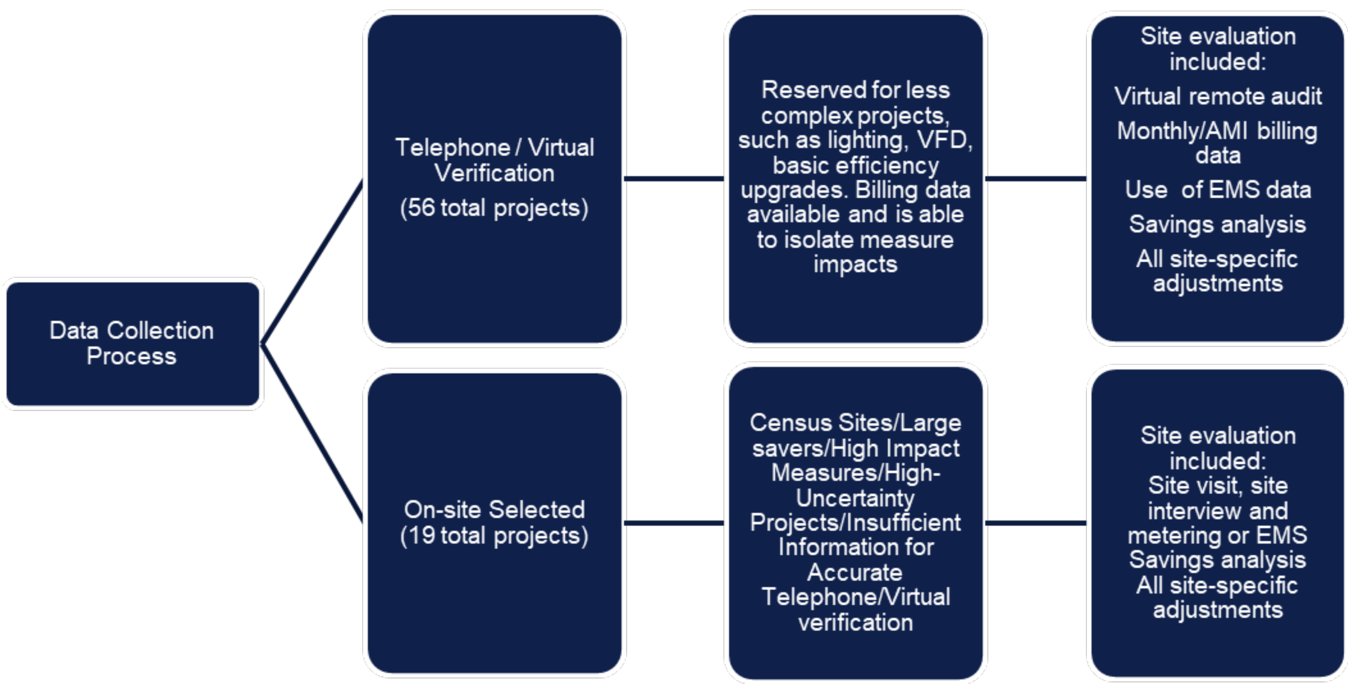
Data collection

Data collected for projects varied from site to site, including:

- On-site verification of installed equipment.
- Customer verification of installed equipment, including pictures and video, when possible, for confirmation.
- Customer reported EMS/trend log data on current operational conditions including but not limited to load, hours of use, process temperatures, and seasonal variations. This information is collected for current conditions as well as historical changes since measure installation.
- Trend data from onsite monitoring systems or building management systems that show equipment operation.
- Production data if equipment operation is directly related to production.

Figure 3-2 provides an overview of the data collection process and the key differences between processes for different sites.

Figure 3-2. Data collection process

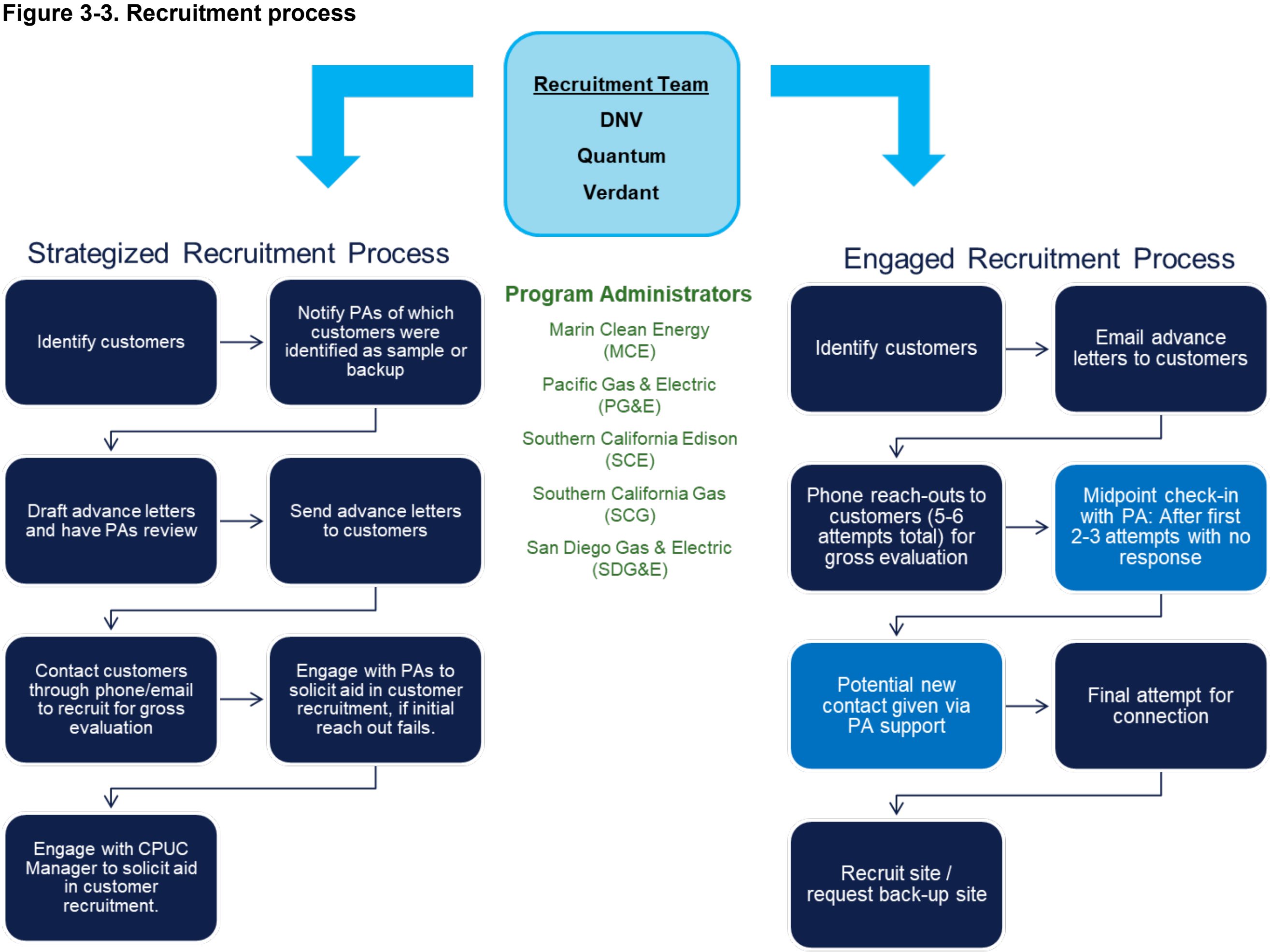


Gross recruitment

Recruitment efforts started with an introductory email sent to prospective participants. Once initial contact was made, the team attempted to reach the participants by phone at different times of day and different days of the week to maximize contact success. We used each M&V plan to guide site contact interviews to collect updated parameters for the savings calculations. The sample contained projects with multiple measures installed.

Recruitment efforts started in mid-September 2023. These efforts engaged one lead recruiter and two active recruiters at DNV, as well as support from two subcontractors, Quantum and Verdant. Most of the sites recruited were within the expected number of attempts, ranging between one and five outreaches, with an initial email that included a description of the site and a customer notification letter. Though our team had many successful outreaches on our own, we had support from the PAs and CPUC when needed. If it weren't for both parties' efficient email replies with updated information, quick phone calls, and suggested support for implementing different patterns of outreach methods, we may not have had such success. Our collaborative efforts made this recruitment process efficient and smooth from start to complete. The evaluation team was able to fulfill all 75 targeted sites through recruitment. The recruitment process is outlined in Figure 3-3. We also provided examples of some of our challenges.

Figure 3-3. Recruitment process



One PG&E project (PRJ – 02334279) proved difficult to recruit, with a total of 18 reach-outs among four different contacts. The first contact for this site (who was the original applicant) no longer worked at the facility, and their replacement was unaware of the program and didn't feel they were able to contribute. A subsequent contact was dismissive and had no desire to support evaluation efforts, and the last contact directed us back to a previous contact. We were able to obtain PA assistance and engaged with the CPUC to ultimately recruit the customer with the third contact originally given. This effort was supported by many, including the DNV team's recruiter, lead recruiter, project manager, and senior engineer, then PGE's Lead and Representative, and the CPUC's Lead.

An MCE project was equally difficult to recruit but took a different path with an easier conclusion. This site was initially scheduled within the first few call attempts. After the engineer completed the preliminary call, it was determined that the site contact was no longer at the facility and there was a new tenant. The recruiter was then given the building contact information and reached out to see who was available in the specific unit where the application specified. The new contact confirmed having no availability to support our project. Amid the back and forth between the new tenants and building owner, DNV asked for support from MCE to provide the latest contact information. Since there was no easy way to fill the void, a backup was pulled for this site and recruited successfully.

Of the 75 gross sample points, DNV targeted 30 sites for on-site verification efforts. We were able to successfully complete 19 of the targets, while the remaining sites received telephone and/or virtual verification. The remaining 11 projects that did not receive an on-site visit were determined to not benefit from a physical visit or were not responsive to recruitment efforts.

Despite the challenges, the evaluation team was able to work with the CPUC and the PAs to overcome recruitment obstacles, and only ten facilities were pulled as backup sites across the three teams. Increasing customer education and awareness around project requirements to participate in EM&V activities should increase customer participation in future evaluations.

Net recruitment

The initial net recruitment goal was 150 sites – a sample similar in size to what had been achieved for the PY2020-2021 CIAC impact evaluation (159 sites). Because the PY2022 CIAC population was much smaller than the PY2020-2021 CIAC population (293 sites vs. 2,267 sites) this 150-site goal was much larger than the predicted sample size needed to achieve 90/10 precision targets. However, the evaluation team adopted this "stretch goal" of 150 sites primarily because it hoped to recruit enough HTR sites to allow for a meaningful comparison of NTGRs between HTR and non-HTR sites. The 51% completion rate necessary to reach the stretch goal would have been unprecedented. The PY2020-2021 completion rate was 7%, for example. In the PY2020-2021 CIAC impact evaluation, the number of recruited HTR sites was too small to allow for such an analysis.

To hit this ambitious 150-site target, the evaluation team shared the target sites in the net sample with the PAs and asked for their assistance in recruiting these sites. In addition, the evaluation team reached out to the PAs for assistance much earlier in the recruitment process (early November) than had been the case for the PY2020-2021 CIAC impact evaluation (early December). Furthermore, for most sites, the evaluation team made as many five attempts to complete surveys, which is more than the three attempts that the CPUC requires.

3.2.2 Measure analysis

As part of each site-specific evaluation, we collected facility- and measure-specific information from the participant, including consumption data, photographic evidence of installed equipment or controls, trend data if available, equipment functional tests, and any other supplemental information to confirm current operation and load. When PA-provided data was available to complement the analysis, we considered it for inclusion. All sample points used current post-installation data acquired from the customers, consumption data, and/or photographic evidence directly from the customer or on-site verification efforts.

After completing the program file review and conducting the site interview or virtual audit with the customer, the evaluation engineers finalized M&V plans based on the updated information from the site and developed the final analysis approach, which is discussed further for Custom and SBD individually in Section 3.2.2.1. This finalized the M&V plan within the CCT reflected limitations and achievements in executing the planned site-level tasks. The CCT also identified any discrepancies or significant changes found throughout the evaluation process.

After reviewing current data provided by the customer, the engineers determined the viability of repurposing PA-provided analysis templates or creating new custom evaluation analysis templates. The final M&V plan documents the engineering approach determined to be best suited based on measure-specific requirements to accurately determine savings. Inputs and assumptions were clearly documented based on trend data, spot measurements, or other information gathered from the customer, including photographs of building management system (BMS) settings. We assigned the adjustments made to savings estimates in the process described above to various categories to understand program savings drivers. These categories of discrepancy adjustment factors are summarized in Section 4.

The diversity of Custom projects warrants careful consideration when selecting the most defensible and cost-effective M&V for each sampled project. We assessed several key criteria to assign project-level rigor, as illustrated in Table 3-4, and further detailed in the following sections.

Table 3-4. Savings discrepancy factors

Adjustment factor	Description
Tracking data	Differences attributed to incorrect adjustments or unexplained changes to savings that occurred between completion of the analysis and entry into the PA tracking system.
Ineligible project	Circumstances around measure approval by the PA are not consistent with CPUC policies, guidance, and rulebook eligibility.
Measure count	Differences attributed to the number of units used in the project calculations and the number of units operating at the time of evaluation.
Inappropriate baseline	Represents a difference in evaluated and reported baseline, including a different standard practice, or pre-existing baseline.
Inoperable measure	The measure is no longer operating at the time of evaluation, whether it has been decommissioned or removed from site.
Operating conditions	Evaluator M&V or collected trend data informs different operating parameters, including hours of use, setpoints, efficiency, etc.
Calculation methods	Differences attributed to changes in calculation methodology between that used for forecasting savings and evaluation analysis. The evaluator only changed analysis methodology when necessary to accurately calculate savings such as employing an 8760 model.
Other	Differences that cannot be attributed to other categories due to their unique nature.

3.2.2.1 Custom-specific analysis methods

This section includes a discussion of Custom-specific methods not covered in Section 3.2.1, broken out by non-lighting and lighting measures.

Non-lighting

Custom non-lighting projects, by nature, are unique and therefore warrant tailored approaches to estimate energy and demand savings. However, based on our experience with evaluating Custom non-lighting projects in California since 2006, certain measure groups are more conducive to a templated analysis approach. During the development of the M&V plan, we determined the viability of repurposing the PA-provided analysis templates for use as the evaluated model with current information provided by the participant. If the previously used approach was determined to not be a viable method or if we identified a more accurate savings approach, alternative approaches were used or developed. These instances generally relied on previously developed and automated M&V tools that leverage high-frequency trend data. Some of the key features for these in-house tools/savings approaches are as follows:

- Reliable analysis with built-in engineering guidance regarding appropriate assumptions and applications
- Traceable calculations including relevant citations
- Automatic vetting of input and output parameters for improved quality control
- Automated 8,760 spreadsheet tool

When required, a typical meteorological year (TMY) climate zone (CZ) 2010 (CZ2010) dataset based on the specific California climate zone location was used for temperature-sensitive calculations. Energy savings were either calculated by the hour in an 8,760 model or allocated to each hour in the year to estimate demand and annual savings impacts. Each analysis provided estimates for annual savings and demand, as specified in the DEER 2020 update. The following demand definitions were used to calculate peak demand reduction:

- The peak demand impacts of energy efficient measures (EEMs) are represented by the average kWh reduction over a 15-hour window.
- The 15-hour window is from 4 p.m. to 9 p.m. (5 hours) over a three-day “heat wave” that occurs on consecutive days in June through September.
- The first day of that heat wave is determined for each climate zone and marks the start date for the peak demand period.
- Consistent with Title 24 and CZ2010, a 2009 calendar year was used to determine which days are weekends and holidays.

The following provides an example of estimating energy savings for an HVAC retro-commissioning (RCx) project in this study. This project involved schedule optimization and discharge static pressure reset on air handling units. To quantify the savings, the PA used a custom tool to model savings, which used actual trends to develop regressions against outdoor air temperature (OAT) for the same data period. Aligning with the IPVP Option B approach, the DNV evaluator gathered the most recent trend data and developed regressions against OAT for the same period, applying these regressions to CZ2010 weather bins to estimate energy savings at each bin. When developing the site-specific M&V plan, the DNV evaluator determined the PA approach to be a viable and accurate option and used it as a basis for determining evaluated savings. As a part of the data collection efforts, the evaluator was able to collect up to six months of recent trend data, providing valuable insights into the current operation of the impacted equipment. The evaluator adhered to Option B as the chosen evaluation methodology, employing provided trend data to develop regressions against OAT and applying these regressions to local CZ2010 weather data to accurately determine energy savings for the impacted equipment.

Similar details can be observed in each site-specific CCT, which are provided as deliverables within this report. These CCTs detail the specific analysis methods used for each project, including a high-level discussion of algorithms, inputs, assumptions, and calibration methods where applicable.

Lighting

We evaluated lighting-only sites via on-site and telephone surveys with each site contact. The evaluation team gathered information with site contacts on five items: 1) Confirm measure installation and measure quantities, (2) Obtain self-reported lighting operating hours, (3) Gauge the condition and functionality of the lighting equipment removed to determine if the lighting installed was accelerated replacement or normal replacement, (4) Obtain information about the lighting equipment removed, (5) Obtain information about lighting controls, (6) Assess code compliance when applicable, and (6) Review pre- and post-installation usage to validate energy savings and take corrective steps as needed.

Each lighting-only project had a savings calculator called a Modified Lighting Calculator (MLC).[32] Parameters of PA-provided project-specific MLCs were adjusted by the evaluation engineers based on information in the project documentation and reported from each customer contact. Below we list the general approach for site-level evaluation of lighting projects.

1. We verified that the facility type and location from the project documentation agree with the savings calculator inputs. These factors determine the DEER hours of use (HOU), coincident demand factor (CDF), and HVAC interactive effects (IE) parameters for the savings calculation.
2. We compared measure quantities and type (long fluorescents vs. high-intensity discharge and indoor vs. outdoor) as reflected in documentation invoices, photographs, or project feasibility studies, with quantities and measure types as input into the savings calculator and updated them based upon survey responses.
3. We verified that the measures installed were eligible.
4. We estimated HOU and CDF using self-reported lighting hours of operation and used adjustment factors developed from previous evaluations for consistency.[33,34]
5. We confirmed and revised accelerated replacement (AR)/normal replacement (NR) categorization as necessary based upon respondent reports on whether the lighting project was necessary because lights were already failing or not providing adequate lighting, or if the project had low program influence using the preponderance of evidence standard.
6. We verified model wattage inputs for the existing measure, SP measure, and new LED measure were correct and reflected measure information on Design Lighting Consortium (DLC) as reflected in the equipment spec sheets from the project documentation.
7. When possible, used CIS billing data to confirm lighting calculator inputs and verify savings and incentive capping.[35]
8. We applied the effective useful life (EUL) and remaining useful life (RUL) inputs to lifecycle savings calculations.

An example of this approach is for an industrial facility where the vendor used the MLC to determine savings. The inputs, including quantity and technology provided within the MLC, matched the scope of work and equipment level information such as wattage was verified based on product spec sheets and DLC screenshots. After confirming all project inputs, the evaluator adjusted the PA-provided MLC and modified the inputs based on information gathered from the customer, including HOUs.

An industrial park replaced pole and exterior wall HIDs with LEDs. The PA claimed the project MAT as accelerated replacement (AR). The evaluation engineer reviewed project documentation, photographs, invoices, equipment spec sheets, and the MLC lighting model used by the implementer to estimate savings. A customer survey verified the quantities installed, the type of equipment removed, the current operation schedule of the new lights, and asked questions about the likelihood that the customer would have installed the same measure at the same time in the absence of the program. Based on customer responses and the documentation provided, the evaluation engineer determined not only that the lighting replaced was old and failing, but also that the customer overhauls exterior lighting for newly acquired facilities as a matter of company policy – meaning the correct MAT=NR. The evaluator verified that the building type and climate zone inputs to the MLC were correct. The evaluator used the customer-reported lighting operation schedule to develop an adjusted, self-reported HOU – which was within 25% of the DEER HOU that are used in the MLC model, so the DEER HOU were left unchanged. The EUL claimed by the PA was also confirmed and left unchanged. In normal circumstances, the change of MAT=NR from AR would be the only source of discrepancy between the evaluated savings and the claimed savings. However, the evaluator found data entry errors in the per-unit savings claimed by the PA: the data entry person must have mistaken the meaning of first and

[32] Most sampled projects had Modified Lighting Calculator (MLC), which is the required calculator as of PY22. Five sampled horticultural projects used the GrowGreen Calculator.

[33] Group D Evaluation, *2019 Custom Industrial, Agricultural and Commercial (CIAC) Impact Evaluation*, February 1, 2022, SBW https://pda.energydataweb.com/api/view/2583/GroupD-CIAC%202019%20Ex%20Post%20Evaluation%20PDF%20Final%202.pdf

[34] Since these adjustment factors have a standard deviation of 25%, we only replaced the DEER HOU and CDF if the evaluated values were different by more than 25%.

[35] Since some of the important parameters that influence the savings calculation (HOU, CDF) are DEER-based, in some cases the resulting lighting savings might exceed monthly energy usage for the site. If this occurs, the lighting models apply a cap to the savings, and to the custom incentive paid.

second baseline columns in the Summary tab of the MLC. As a result of erroneous per-unit savings values, the PA claimed first-year and lifecycle savings that were one order of magnitude higher than the MLC suggested. The fact that the PA claimed – and documented – the correct incentive suggested by the MLC indicates that this was a data entry error, rather than an intentional overestimation of savings. Overall, the evaluated savings are much smaller than the claimed savings, with the bulk of the reduction attributable to the PA data entry error.

Similar details can be obtained by reviewing each individual lighting-only CCT. The example above is complicated by the data entry error.

3.3 Net savings methods

The net evaluated savings plan was built on DNV's prior experience with custom project attribution research in California. Our team continued to use the 2015 NTG survey instruments it used in the previous evaluation (PY2020–2021), with some minor changes in question wording in response to stakeholder comments on the previous evaluation report. This instrument was designed to be used for specific program designs including the SBD program.

3.3.1 NTG data collection

The DNV team used a combination of approaches to field the various survey instruments. Enhanced rigor interviews, for the largest savers and most complex projects, involved interviews of several entities involved in the project. These included primary decision-makers, CFOs, vendor representatives, utility account executives, program staff, and other decision influencers, as well as a review of market data to help establish an appropriate baseline.

As a starting point, we used project size, as measured by program incentives, as the criterion for assigning projects into either the basic rigor, standard rigor, or high rigor category. However, we changed the breakpoints from those used to assign projects to the rigor bins in the last round (e.g., less than $250,000 in incentives for the basic rigor category, $250,000 to up to $1 million in incentives for the standard rigor category, and greater than $1 million in incentives for the enhanced rigor category). Assignment of projects to the rigor categories in the current study were based on the following criteria:

- *Enhanced rigor:* The starting point for this category is projects that are in the top 10% of projects based on incentive amount. We added, to this initial group, any project that contain important measures, or which are especially complex (e.g., contain a mix of measure application types). While project size and complexity are usually correlated, this is not always the case.
- *Standard rigor:* This category included the next quartile of projects in terms of incentive amounts after those already included in the enhanced rigor category.
- *Basic rigor:* This category included all the remaining projects that did not qualify for the enhanced rigor or standard rigor categories described above.

The gross and net savings teams worked together to reduce the amount of time between the completion of the gross savings analysis and the completion of the net savings analysis. This is important because if projects that make claims about AR have evaluated NTGRs at or below 0.5, the gross savings overturns the AR MAT and establishes a different baseline for their analysis.

Some of the surveys for repetitive measures, like lighting, were conducted via computer-aided telephone interview (CATI) software. Use of a CATI approach had several advantages: 1) the surveys were customized to reflect the unique characteristics of each program, and associated program descriptions, response categories, and skip patterns; 2) it drastically reduced inaccuracies associated with the more traditional paper and pencil method; and 3) the process of checking for inconsistent answers was automated, with follow-up prompts triggered when inconsistencies are found.

Our sampling approach was to attempt to complete NTG surveys/interviews with the full population of embedded projects. Since, in the last round, we had a much higher survey/interview completion rate using DNV staff than the CATI firm, in the current round we reserved the NTG surveys/interviews with the ~75 embedded projects for the DNV team and had the CATI firms focus on the ~74 net only projects. The original net sample design targeted 150 participants, an ambitious goal that would require completions with over 50% of the population. Due to difficulties in getting survey responses, 72 were completed and used in the NTG analysis.

DNV's data collection approach varied based on the NTG rigor assigned to the project (see assignment criteria above):

- *Basic rigor:* Participants in this group were given NTG surveys that contained all the key questions used for NTG scoring used in the standard/enhanced rigor interview guides, but with fewer follow-up questions for qualitative elaboration of the scores and with generally shorter, simpler question batteries.
- *Standard rigor:* Participants in this group were given in-depth interviews with more complex and comprehensive question batteries than the basic rigor surveys. In some cases, these interviews included multiple decision-makers. These included vendor interviews as indicated by customer responses. In addition, two different evaluators reviewed almost all standard rigor evaluations. In two cases, this was used to revise the original NTG assessment.
- *Enhanced rigor:* Participants in this group were given in-depth interviews nearly identical to those administered for the standard rigor participants. However, enhanced rigor projects were subjected to more research from the evaluation team as to how the project baseline assumptions compare to those from Common Practice Baseline studies. In addition, because of their greater size, enhanced rigor projects were more likely than standard rigor projects to require NTG interviews with multiple project influencers. Enhanced rigor included a similar quality control approach as described above for standard rigor.

The evaluation team added some questions to the basic rigor NTG survey for the PY2022 evaluation to: 1) allow for the estimation of the frequency with which participating customers had corporate sustainability policies, and 2) ensure that participants were not having their net savings diminished in cases where these policies were driving the implementation of energy efficiency projects. This second objective was to ensure compliance with CPUC Resolution E-4818, which discourages using sustainability policies against program influence.[36]

These questions were added because the prior version of the basic rigor NTG survey did not allow evaluators to distinguish between company policies that were sustainable in nature, which should not count against projects in NTG calculations according to CPUC Resolution E-4818, and other corporate policies that the NTG methodology would consider as non-program factors that could potentially reduce the NTGR. Because the standard/enhanced rigor interview guide already had questions for identifying the existence of corporate sustainability policies, there was no need to add similar questions to the guide.

3.3.2 NTGR estimation approach and scoring

DNV used the following three scores to calculate the NTGR:

- **Program attribution index 1 (PAI-1)** score reflects the influence of the most important of various program and program-related elements in the customer's decision to select the specific program measure. We also incorporated program influence through vendor recommendations in this score. The final PAI-1 score is based on the highest rating for a program influence factor divided by the sum of the highest rating for a program influence factor plus the highest rating for a nonprogram influence factor.

[36] "Sustainability policies or energy policies have been shown to be highly indicative of energy efficiency and integrated demand side management measure uptake. As such, we promote the adoption of these policies and withdraw from the guidance document the example of using a sustainability policy as evidence against program influence."

- **Program attribution index 2 (PAI-2)** score captures the perceived importance of the program (whether rebate, recommendation, training, or other program intervention) relative to nonprogram factors in the decision to implement the specific measure that was eventually adopted or installed. We determined this score by asking respondents to assign importance values to both the program and the nonprogram influences so that the two total 10. We then adjusted the PAI-2 score (i.e., divided by 2) if respondents said they had already made their decision to install the specific program-qualifying measure before they learned about the program.
- **Program attribution index 3 (PAI-3)** score captures the likelihood that they would have selected the exact same equipment if the program had not been available (the counterfactual). The PAI-3 score was calculated as 10 minus the likelihood of installing the same equipment.

We calculated the NTGR as the average of these three program attribution index scores.

4 RESULTS

In this section, we present our findings related to gross and net savings by key reporting dimensions. This section also includes a discussion of the impact of baseline changes, reasons for differences in gross savings, and a comparison of findings to those from previous impact evaluations. Below, we have included our examination of the reliability, sensitivity, and drivers of the NTGR, which measures the program's influence on decisions to implement efficiency measures.

4.1 Gross electric savings and realization rates

This section provides gross electric savings and realization rates results. Figure 4-1 compares the weighted forecasted and evaluated first-year electric energy savings for all sites in the final sample. The colors of the markets on each plot show Custom and SBD sites. The diagonal dashed line indicates where each sample point would have been plotted had the forecasted estimates been 100% accurate. The points below the dashed line represent sites with evaluated savings less than the forecasted estimate, while those above the line are instances where evaluated savings were larger than the forecasted estimates. Seen in this way, there are a couple of large sites along the dashed line indicating these forecasted estimates were fairly accurate. But there are many more below it that includes several with zero savings. Of the 71 electric projects included in our sample, 15 were evaluated to have no, or negative, electric savings. The scatterplot in Figure 4-2 focuses on the dispersion of sites on the lower left quartile of Figure 4-1.

Figure 4-1. Weighted Custom and SBD first-year electric energy savings scatterplot (all sites)

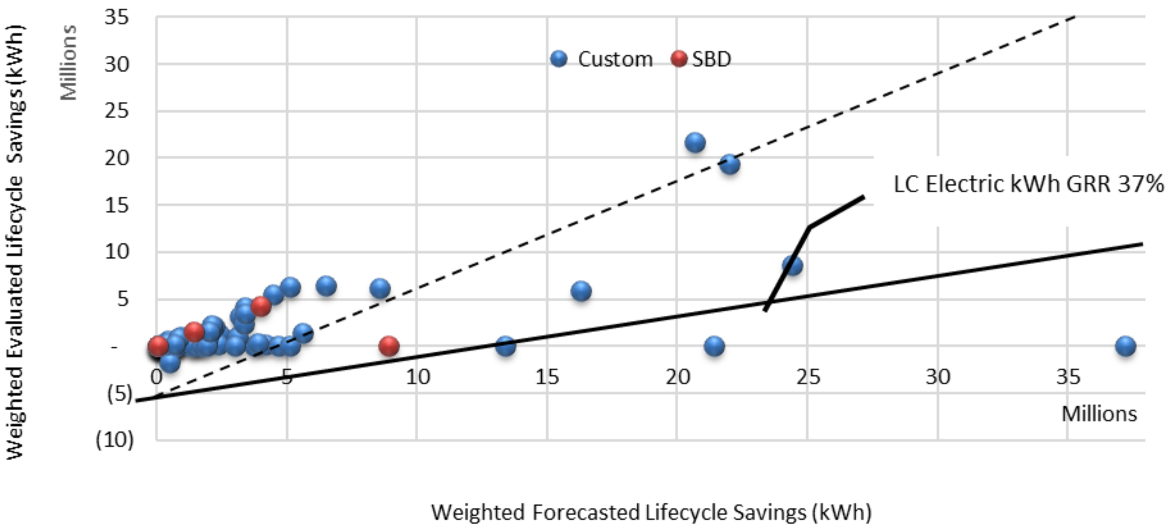
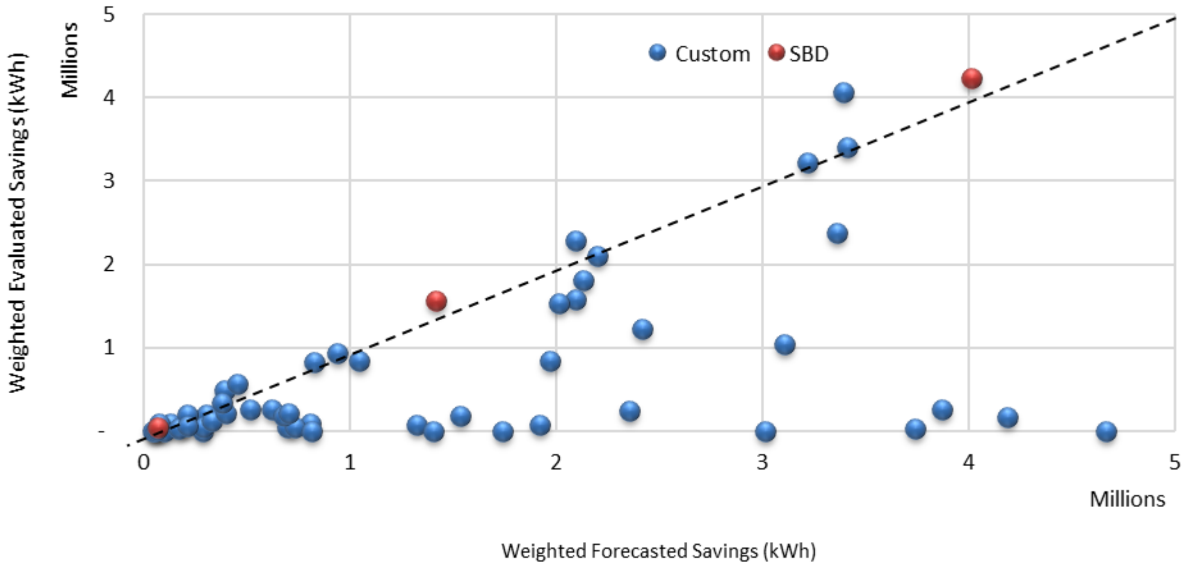


Figure 4-2 refocuses the scatterplot above on sites with forecasted values of less than 5 million kWh. This view shows the number of ineligible projects and any with zero savings along the x-axis. In addition, it becomes clearer that many sites in this group fall below the dashed line, indicating evaluated savings less than forecasted estimates. The combined impact of these sites influenced a final first-year electric GRR of 37% and lifecycle GRR of 38%.

Figure 4-2. Weighted Custom and SBD first-year electric energy savings scatterplot (up to 5M kWh)



A series of tables that present various reporting dimensions follow. The first one, Table 4-1, and all other electric and gas gross results tables are laid out similarly. The first series of result columns are first-year energy (top half) and demand (bottom half) savings with the second group of columns showing energy and demand for lifecycle savings.

4.1.1 Gross savings results by subject area

Table 4-1 summarizes the first-year and lifecycle forecasted savings, evaluated savings, GRR, and relative precision at the statewide level and for each subject area. The statewide CIAC first-year MWh GRR is 37%, with a relative precision of ±23%. The Custom subject area within CIAC, representing most forecasted savings (approximately 98%), had a first-year MWh GRR of 37% with a relative precision of ±24%. The SBD subject area, representing approximately 2% of forecasted savings, had a first-year MWh GRR of 90% with a relative precision of ±5%. The statewide CIAC lifecycle MWh GRR is 38% with a relative precision of ±16%. Custom and SBD lifecycle MWh GRRs are 37% and 96%, respectively, with relative precisions of ±17% and ±5%, respectively. Of the 75 projects sampled, 5 were SBD and 70 were Custom.

The statewide CIAC first-year MW GRR is 50%, with a relative precision of ±17%. The Custom subject area within CIAC had a first-year MW GRR of 47% with a relative precision of ±19%. The SBD subject area had a first-year MW GRR of 94% with a relative precision of ±3%. The statewide CIAC lifecycle MW GRR is 46% with a relative precision of ±20%. Custom and SBD lifecycle MW GRRs are 42% and 102%, respectively, with relative precisions of ±23% and ±2%, respectively.

Table 4-1. Statewide gross electric energy and demand savings results by subject area

Subject area	First-year				Lifecycle			
	Forecasted savings [a]	Evaluated savings	GRR	Relative precision[b]	Forecasted savings [a]	Evaluated savings	GRR	Relative precision[b]
Energy (MWh)								
Custom	30,225	11,063	37%	±24%	249,267	91,733	37%	±17%
SBD	470	422	90%	±5%	6,783	6,508	96%	±5%
Total	**30,695**	**11,485**	**37%**	**±23%**	**256,050**	**98,241**	**38%**	**±16%**
Demand (MW)								
Custom	2.8	1.3	47%	±19%	28.9	12.2	42%	±23%
SBD	0.1	0.1	94%	±3%	2.1	2.2	102%	±2%
Total	**2.9**	**1.5**	**50%**	**±17%**	**31.0**	**14.4**	**46%**	**±20%**

[a] Forecasted savings represent engineering estimates and do not include the realization rate that has been applied in savings presented in ED Tracking data.
[b] Relative precision at the 90% confidence interval.

Statewide and subject area GRRs were largely influenced by ineligible projects. Ineligible projects include projects that violate CPUC policy guidance, statewide custom program rules, program rules established by their representative administrator, and the installation of ineligible measures. Changes in operating conditions also had a considerable influence on GRRs across all subject areas, including updated baseline conditions, HOUs, and efficiencies. We have provided additional details of these discrepancies in Section 4.1.4 and Section 4.2.3. The reduction in lifecycle GRR as compared to the first-year GRR is primarily driven by the lower evaluated EUL/RULs as compared to forecasted EUL/RUL.

The worse-than-expected relative precision at the statewide level was driven by results in the custom subject area. DNV found that 15 projects had zero or negative gross realization rates. For example, of the top 10 forecasted savings projects, which represent approximately 16.5 million kWh of claimed savings, the evaluated savings associated with those projects was found to be approximately 3.4 million kWh. Gross realization rates within these 10 projects ranged from 0% to 105%. This high variability, especially among the largest forecasted savings projects, worsened the overall relative precision.

Conversely, the low relative precision for the SBD subject area is a result of low SBD total population count (11 projects in total) and the evaluation capturing all but one project that claimed first-year electric savings in the sample, accounting for 96% of total forecasted savings. Additionally, variability of the SBD subject area was lower at 51% to 99% when compared to the Custom subject area, which had the GRRs varying from 0% to 105%.

The same reasons affected the relative precision for demand savings for both subject areas.

Differences were observed in GRR for program areas between annual and lifetime results. These differences were driven by the evaluator-applied EUL and RULs determined to be appropriate for each project. In general, a higher GRR for lifecycle savings compared to FYGRR reflects an average increase in EUL or RUL, while a lower GRR for lifecycle reflects a decrease in evaluated EUL or RUL. We observed the same trends for demand. These findings are explored in greater detail in Section 4.4.

4.1.2 Gross savings results by PA

Table 4-2 summarizes the first-year and lifecycle forecasted savings, evaluated savings, GRR, and relative precision at the PA level. We presented all results at the 90% confidence interval.

MCE, representing approximately 13% of forecasted first-year MWh, had a first-year MWh GRR of 28% with a relative precision of ±67% and a lifecycle MWh GRR of 31% at ±67%. The evaluation found that for multiple lighting projects, savings values entered into the CEDARS system were incorrect when compared to project documentation. This administrative error, in addition to differences in evaluated operating conditions when compared to forecasted operating conditions, were the primary drivers of the GRR.

PG&E, representing approximately 83% of forecasted FY MWh savings, had a first-year MWh GRR of 43% with a relative precision of ±17% and a lifecycle MWh GRR of 39% ±16%. PG&E's GRRs were largely impacted by differences in evaluated operating conditions and calculation methods. Two projects are of particular note. One lighting project, which forecasted approximately 3 MWh, was overturned from an accelerated replacement project to normal replacement resulting in a project first year GRR of 16%. Another lighting project, representing 2.3 MWh of forecasted savings, was found to have the lighting measures completely removed from the premises, also resulting in zero savings. These two projects alone represent approximately 21% of PG&E's total forecasted savings. Both projects were in the census stratum and do not represent other sites in the sample design, thus the adjustments apply only to these two projects. PG&E's decrease in lifecycle GRR as compared to the first-year GRR was caused by projects that have lower evaluated EUL and RUL compared to the forecasted value.

SDG&E, representing approximately 4% of forecasted MWh savings, had a first-year MWh GRR of -33% with a relative precision of ±399% and a lifecycle MWh GRR of 35% ±141%. The evaluated sample accounted for approximately 74% of the total forecasted lifecycle savings of the SDG&E population. The negative GRR is being driving by one project. The evaluation found that of the three control upgrade measures included in the project, one measure was not operational and the remaining two measures were irrelevant to the actual system operations, and they did not result in energy savings. In addition to the PY2022 savings being zeroed out, savings assigned to this project in the PY2020/2021 evaluation, approximately 166,828 kWh, were also removed, resulting in a total project savings of negative 166,828 kWh. This project was sampled in both PY2020/2021 and in PY2022. In PY2020/2021, DNV interviewed a site contact that confirmed operation of the measures as intended. During the PY2022 evaluation, we conducted both on-site verification and documented savings through personnel interviews and confirmed with the facility manager most familiar with the project that the measures were not installed, in either PY2020/2021 or PY2022. Because this project is a High Opportunity Program and Projects (HOPPs) project, savings are trued up annually and resulted in a negative savings to account for the over attribution in PY2020/2021.

MCE had a first-year MW GRR of 45% with a relative precision of ±28% and a lifecycle MW GRR of 25% ±53%.

PG&E had a first-year MW GRR of 57% with a relative precision of ±23% and a lifecycle MW GRR of 48% ±22%.

SDG&E had a first-year MW GRR of 94% with a relative precision of ±3% and a lifecycle MW GRR of 102% at ±2%. SDG&E's high first-year and lifecycle MW GRR, when compared to energy GRRs, can be attributed to the high demand GRRs (unweighted average of 84%). The negative savings project noted above did not claim demand savings, as such, did not impact the MW GRR. The low variability in GRRs, ranging from 46% to 100% contributed to the low relative precision.

As described above for different program areas, there are observed differences in GRR between annual and lifetime results. These differences were mainly driven by the evaluator-applied EULs and RULs determined to be appropriate for each project. On average, we found a reduction in EUL reduced the lifecycle GRR compared to first year results for all PAs. We observed the same trends for demand. Table 4-2 provides results including the aforementioned HOPPs project, denoted as an outlier.

Table 4-2. Statewide gross electric energy and demand savings results by PA with outlier

Subject area	First-year				Lifecycle			
	Forecasted savings [a]	Evaluated savings	GRR	Relative precision[b]	Forecasted savings [a]	Evaluated savings	GRR	Relative precision[b]
				Energy (MWh)				
MCE	4,078	1,147	28%	±67%	20,102	6,289	31%	±67%
PG&E	25,328	10,767	43%	±17%	226,706	88,750	39%	±16%
SDG&E	1,289	-429	-33%	-±399%	9,241	3,203	35%	±141%
Total	**30,695**	**11,485**	**37%**	**±23%**	**256,050**	**98,241**	**38%**	**±16%**
				Demand (MW)				
MCE	0.1	0.06	45%	±28%	1.4	0.3	25%	53%
PG&E	2.6	1.3	48%	±20%	27.6	11.9	43%	24%
SDG&E	0.1	0.1	94%	±3%	2.1	2.2	102%	2%
Total	**2.9**	**1.5**	**50%**	**±17%**	**31.0**	**14.4**	**46%**	**±20%**

[a] Forecasted savings represent engineering estimates and do not include the realization rate that has been applied in savings presented in ED Tracking data
[b] Relative precision at the 90% confidence interval.

Table 4-3 present the results without the outlier. The impact of this project on the statewide GRR is minimal, as SDG&E accounted for a relatively small percentage of overall savings. As shown in the table, with the outlier removed, the first-year energy GRR for SDG&E is 80%. These results are being provided for informational purposes to further inform the reader on the impact of this one project.

Table 4-3. Statewide gross electric energy and demand savings results by PA without outlier

Subject area	First-year				Lifecycle			
	Forecasted savings [a]	Evaluated savings	GRR	Relative precision[b]	Forecasted savings [a]	Evaluated savings	GRR	Relative precision[b]
				Energy (MWh)				
MCE	4,078	1,147	28%	±67%	20,102	6,289	31%	±67%
PG&E	25,328	10,767	43%	±17%	226,706	88,750	39%	±16%
SDG&E	1,289	1,029	80%	±0.2%	9,241	6,483	70%	±1%
Total	**30,695**	**12,943**	**42%**	**±15%**	**256,050**	**101,521**	**40%**	**±14%**
				Demand (MW)				
MCE	0.1	0.06	45%	±28%	1.4	0.3	25%	±53%
PG&E	2.6	1.3	48%	±20%	27.6	11.9	43%	±24%
SDG&E	0.1	0.1	90%	±0.4%	2.1	2.1	98%	±1%
Total	**2.9**	**1.4**	**50%**	**±17%**	**31.0**	**14.3**	**46%**	**±20%**

[a] Forecasted savings represent engineering estimates and do not include the realization rate that has been applied in savings presented in ED Tracking data
[b] Relative precision at the 90% confidence interval.

4.1.3 Gross savings results by measure type

Table 4-4 summarizes the statewide first-year and lifecycle forecasted electric energy savings, evaluated savings, GRR, and relative precision by measure type. Projects were further stratified by whether the project is lighting-only (i.e., lighting) or includes non-lighting measures (i.e., non-lighting). We presented all results at the 90% confidence interval. Lighting, representing approximately 65% of forecasted first-year MWh, had a first-year MWh GRR of 44% with a relative precision of ±20%. Non-lighting measures, representing approximately 35% of forecasted MWh savings, had a first-year MWh GRR of 26% with a relative precision of ±69%. Lighting and non-lighting measures had lifecycle MWh GRRs of 40% and 36%, with relative precisions of ±17% and ±29%, respectively. Of the 75 projects sampled, 43 were lighting-only, while 32 were non-lighting.

Lighting measures had a first-year MW GRR of 63% with a relative precision of ±20%. Non-lighting measures had a first-year MW GRR of 39% with a relative precision of ±30%. Lighting and non-lighting measures had lifecycle MW GRRs of 47% and 46%, with relative precisions of ±19% and ±31%, respectively. The differences between the first-year and lifecycle MW compared to MWh for lighting projects was the result of three main contributing factors; (1) EUL/RUL reduction between forecasted and evaluated savings, (2) a reduction in CDF between forecasted and evaluated savings, and (3) changes to the HOU based on customer information. The higher relative MW GRR for lighting measures, when compared to the MWh is due to differences in operating parameters that do not impact demand savings, such as hours of use adjustments.

The increase in first-year GRR when comparing lighting energy (44%) to lighting demand (63%) can be attributed to (a) the top 10 lighting projects based on first-year forecasted kWh accounted for 74% of all forecasted lighting savings, while those same 10 projects only accounted for 57% of all lighting demand savings, and (b) the unweighted GRR of those same 10 projects was 32% for energy and 76% for demand.

When comparing the first-year lighting demand GRR to the lifecycle demand GRR (63% and 47% respectively), the difference can be attributed to the reduction in lifecycle savings due to evaluation adjustments. When analyzing the top 10 projects based on forecasted demand, the unweighted GRR for first-year demand is 60%, while the unweighted lifecycle demand is 44%. The unweighted average forecasted EUL for these projects was 12.4 years, compared to the evaluated unweighted average of 11.9 years. More impactful, however, is the evaluated RUL of these projects. The unweighted average forecasted RUL was 4.4 years, compared to the unweighted average evaluated RUL of 1.7 years. Thirteen of the 43 evaluated lighting projects had MATs overturned from AR to NR. This reduced the RUL from 4 or 5 years to 0 years.

Table 4-4. Statewide gross electric energy and demand savings results by measure with outlier

Measure type	First-year				Lifecycle			
	Forecasted savings [a]	Evaluated savings	GRR	Relative precision[b]	Forecasted savings [a]	Evaluated savings	GRR	Relative precision[b]
Energy (MWh)								
Lighting	19,822	8,703	44%	±20%	147,909	59,234	40.0%	±17%
Non-lighting	10,872	2,782	26%	±69%	108,141	39,008	36.1%	±29%
Total	**30,695**	**11,485**	**37%**	**±23%**	**256,050**	**98,241**	**38.4%**	**±16%**
Demand (MW)								
Lighting	1.3	0.8	63%	±20%	12.7	6.0	47.2%	±19%
Non-lighting	1.6	0.6	39%	±30%	18.4	8.4	45.8%	±31%
Total	**2.9**	**1.5**	**50%**	**±17%**	**31.0**	**14.4**	**46.4%**	**±20%**

[a] Forecasted savings represent engineering estimates and do not include the realization rate that has been applied in savings presented in ED Tracking data.
[b] Relative precision at the 90% confidence interval.

Table 4-5 presents the results without the outlier. As shown in the table, with the outlier removed, the first-year energy GRR for non-lighting increases from 26% to 39%. These results are being provided for informational purposes to further inform the reader on the impact of this one project.

Table 4-5. Statewide gross electric energy and demand savings results by measure without outlier

Measure type	First-year				Lifecycle			
	Forecasted savings [a]	Evaluated savings	GRR	Relative precision[b]	Forecasted savings [a]	Evaluated savings	GRR	Relative precision[b]
Energy (MWh)								
Lighting	19,822	8,703	44%	±20%	147,909	59,234	40%	±17%
Non-lighting	10,872	4,240	39%	±20%	108,141	42,287	39%	±25%
Total	**30,695**	**12,943**	**42%**	**±15%**	**256,050**	**101,521**	**40%**	**±14%**
Demand (MW)								
Lighting	1.3	0.8	63%	±20%	12.7	6.0	47%	±19%
Non-lighting	1.6	0.6	39%	±31%	18.4	8.3	45%	±32%
Total	**2.9**	**1.4**	**50%**	**±17%**	**31.0**	**14.3**	**46%**	**±20%**

[a] Forecasted savings represent engineering estimates and do not include the realization rate that has been applied in savings presented in ED Tracking data.
[b] Relative precision at the 90% confidence interval.

4.1.4 Discrepancy analysis

This section presents an analysis of the discrepancies that account for differences between forecasted and evaluated savings estimates for the sampled projects. Note that this analysis is based on discrepancies associated with first-year gross savings. Table 4-6 provides describes the discrepancy factors that may have impacted a project.

Table 4-6. Savings discrepancy factors

Discrepancy factor	Description
Tracking data	Differences attributed to incorrect adjustments or unexplained changes to savings that occurred between completion of the forecasted savings analysis and claimed savings entered into the PA tracking system.
Ineligible measure	Measure approval by the PA not consistent with CPUC policies, guidance, and rulebook eligibility.
Measure count	Differences attributed to the number of units used to forecast savings and the number of units operating at the time of evaluation.
Inappropriate baseline	Represents a difference in evaluated and reported baseline, including a different standard practice, code, or pre-existing baseline.
Inoperable measure	The measure is no longer operating at the time of evaluation, whether it has been decommissioned or removed from site.
Operating conditions	Evaluator M&V or collected trend data informs different operating parameters, including hours of use, setpoints, efficiency, etc.
Calculation methods	Differences attributed to changes in calculation methodology between that used for forecasting savings and evaluation analysis. The evaluator only changed analysis methodology when necessary to accurately calculate savings such as employing an 8,760 model.

When gross evaluated impacts for a project were found to be different than the forecasted savings, DNV recorded the associated discrepancy factors and ranked them from most to least impactful. Some projects had only one discrepancy factor. For example, an ineligible project (due to a policy violation or ineligible measure) would be recorded as a single discrepancy. If there were multiple factors (e.g., evaluated parameters were different from the operating parameters and adjustments to baseline conditions occurred), the discrepancies were ranked from most to least impactful, and their associated impact was recorded as a percentage of savings increased or reduced to accurately report on the impact on each discrepancy. Discrepancy factors were classified into seven categories, as presented in Table 4-6.

Figure 4-3 shows the number of instances a given discrepancy occurred, and its impact on overall gross realization rates in the electric sample.

Figure 4-3. Key drivers behind electric GRR

Discrepancy category	Negative impact		Positive impact		Overall	
	# Instances	Impact on GRR	Impact on GRR	# Instances	Impact on GRR	# Instances
Tracking data discrepancy	1	0%	0%	2	0%	3
Ineligible measure	14	-20%	0%	0	-20%	14
Measure count	3	-7%	0%	0	-7%	3
Inappropriate baseline	14	-22%	0%	0	-22%	14
Inoperable measure	2	-3%	0%	0	-3%	2
Operating conditions	16	-9%	2%	6	-7%	22
Calculation method	13	-8%	3%	5	-5%	18
Total	**63**	**-68%**	**6%**	**13**	**-63%**	**76**

The following discrepancies were most impactful in both frequency and the degree of impact on first-year gross savings:

- **Inappropriate baseline** selection or inappropriate use of baseline conditions was a primary driver of deviation in evaluated savings from forecasted savings. Evaluated savings for 14 projects were lower because the evaluators corrected the baseline used in the PAs' savings forecasts. Adjustments in baselines were largely attributed to the use of standard practice for normal replacement projects that incorrectly assigned the pre-existing conditions as the baseline.
  - One project that reported this discrepancy was a custom lighting claim where the applicant reported the project as accelerated replacement. After in-depth discussions with the site contact and review of project documentation, the evaluators determined that the pre-existing lighting was in poor condition and failing prior to the project. This led the evaluators to assign this project as a normal replacement and update the baseline to a standard practice in the MLC. This example is illustrative of a common finding in this category.
  - Another example of a project with this discrepancy was a high efficiency fan claim for a dairy barn. While the installed 81″ fans were more efficient than the standard practice baseline, the interviews with the customer confirmed that the air flow requirements of the barn would not have been met if the fans were sized according to the standard practice baseline of 62″. The only available option to the customer at the time of the measure installation to meet the airflow requirements of the facility was to install the as-built fan, so the evaluators selected it as the appropriate baseline for this specific project.
- **Ineligible measures** resulted in a downward adjustment, as these measures were assigned zero savings. Fourteen projects were evaluated as ineligible and assigned zero savings. When possible, the evaluation team flagged potentially ineligible projects for each respective PA to confirm the status or provide an explanation from already submitted documentation to support a change in the zero-saver assessment. The evaluation team also requested missing documentation before assigning zero savings to the project.
  - Installation date violations occurred in two instances. Projects were installed outside of the allotted timeframe (one year for Custom, four years for SBD, and three years for 3P/Local Government). Unless extensions were filed and provided to the evaluation team, these projects were deemed ineligible.
  - Evaluators also deemed projects ineligible based on the statewide manual[37] requirement that installed custom measures must exceed baseline energy performance and are required to be more energy efficient than the applicable

[37] PGE, "2019 Statewide Customized Offering Procedures Manual for Business," https://www.pge.com/pge_global/common/pdfs/save-energy-money/facility-improvements/custom-retrofit/Customized-Policy-Procedure-Manual_2019.pdf

code/ISP baseline efficiency. Any measure technology that matches a DEER definition for a code baseline is considered a to-code measure.

- **Operating conditions** for primary equipment or action were often verified as different from that when equipment or action was initially implemented. Changes in HOUs, observed load, different control settings, or equipment efficiency were often the primary drivers in adjusting evaluated savings. Sixteen projects were noted as having differing operating conditions that negatively impacted evaluated savings, while six projects were noted as having differing operating conditions that positively impacted evaluated savings.
  - An example of a project that reported this discrepancy is an SBD project. The evaluators updated the fan-schedule and cooling temperature setpoints in the savings analysis model for a university building based on trend data that was collected from building energy management systems (EMS), resulting in an increase in electric savings for this project compared to reported values.
  - Another example of the project with this discrepancy is a BRO-RCx claim that involved the optimization of air handling units' (AHU) operation in an office building when the building was unoccupied. While the PA model claimed that the AHU supply and return fans would be completely off during unoccupied periods, trend data collected by the evaluators revealed that the fans operate at a speed ranging from 1% to 20% during these hours, leading to a reduction in electric savings for this project compared to reported values.
- The **calculation method** used to estimate evaluated savings differed from those used to estimate forecasted savings. This can include differences between methods used to estimate forecasted and evaluated load, weather normalization, savings normalization, peak demand calculation methods, and modeled equipment design. Generally, we were able to repurpose the PA-provided analysis template with current information provided by the participant, unless the provided model was not determined to be a viable method or if we determined a more accurate savings approach. There were 13 projects where evaluated savings were negatively impacted by differing calculation methods, and five projects where savings were positively impacted. Examples of evaluated savings methods included assessing correlations to production data for industrial customers or local weather station data for weather-dependent measures, performing a grid impact assessment when on-site generation was present, use of billing analysis to support evaluated savings, use of pre- and post-collected trend data and spot measurements to inform savings, updating modeling errors within SBD project simulation models, and different engineering calculation approaches based on post-implementation data availability.
  - One project that reported this discrepancy was an SBD project. The PA-provided analysis template did not consider the non-IOU fuel generation analysis, whereas the evaluators adjusted electric savings by performing a grid impact assessment, as the facility had solar PV installed at site.
  - Another example of a project with this discrepancy was a BRO-RCx Year 3 claim. The reported savings calculation approach for this project for handling NREs included a residual analysis for NRE#1 (COVID-19) and an out of model engineering analysis for NRE#2 (LED retrofit project). The evaluators used a different calculation method that used Year 2 consumptions, and thereby excluded COVID-19 affected days from the modeling data and directly accounted for LED retrofits in the model. The evaluators also used weather normalized data for predicting baseline and as-built electricity consumptions resulting in a reduction in savings for this project compared to reported values.

Table 4-7 further examines the impact of the discrepancies discussed above by showing the influence of each on the evaluation adjustments to the tracking estimates. The realization rate in each row is the cumulative realization rate of all adjustments made to that point (i.e., the ineligible product realization rate includes both the tracking data adjustment and the ineligible project adjustment). The order the discrepancies are calculated matters. In Table 4-7 they are listed in the typical order of discovery. Explored in this way, the combined impacts of inappropriate baselines and ineligible projects are clear drivers of the final electric realization rate, eroding the initial forecasted savings of the evaluated sample of 30,695 MWh by 6,680 MWh and 6,061 MWh, respectively.

Table 4-7. Discrepancy impacts on first-year electric savings and GRR

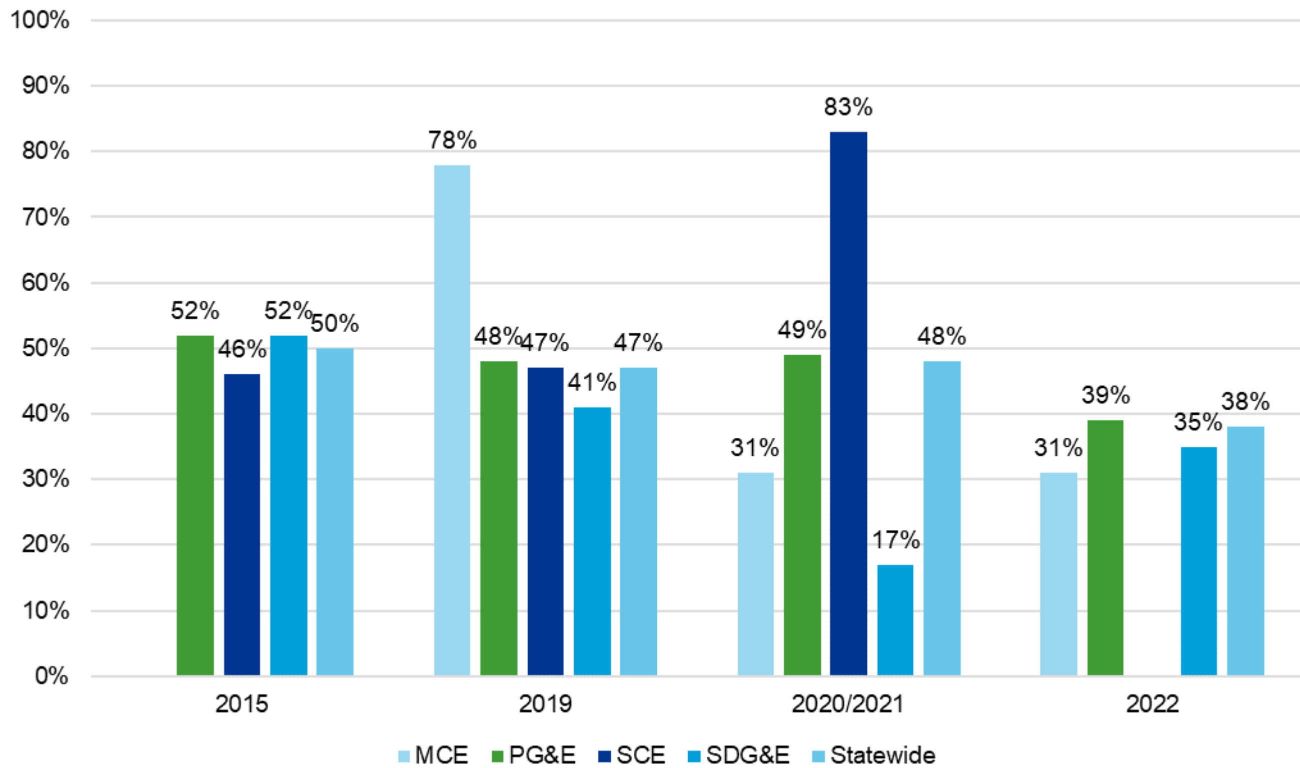
Discrepancy	First-year savings (MWh)	Savings change (MWh)	Realization rate
Forecasted savings	30,695	N/A	N/A
Tracking data	30,695	1	100%
Ineligible project/measure	24,634	-6,061	80%
Inappropriate baseline	17,955	-6,680	58%
Inoperable measure	17,110	-845	56%
Measure count	15,030	-2,080	49%
Calculation methods	13,648	-1,382	44%
Operating conditions	11,485	-2,163	37%
Precision at 90% confidence			**±23%**

4.1.5 Comparison to previous evaluation findings

Figure 4-4 compares the 2022 estimates of electric lifecycle GRR by PA and statewide to prior evaluations. As observed in previous reports, the tendency for GRRs to fluctuate somewhat between evaluated years continues. Some observations from this comparison included the following:

- The MCE GRR is consistent with the PY 2020/2021 evaluation.
- PGE's GRR, although lower in PY2022, is consistent with previous evaluations. The PY2022 evaluation captured PGE's top 10 projects based on lifecycle forecasted kWh savings. These projects accounted for 73% of the PGE population. The unweighted GRR for these projects was estimated to be 25% for lifecycle savings, which heavily influences the lower GRR when compared to previous cycles.
- SCE did not have any projects in the CIAC population in PY2022.
- SDGE's GRR increased from PY2020/2021. As noted above, the GRR of SDGE's population is being heavily driven by one project that had a negative first-year and lifecycle GRR.

Figure 4-4. Statewide electric energy lifecycle GRR results by program year and PA

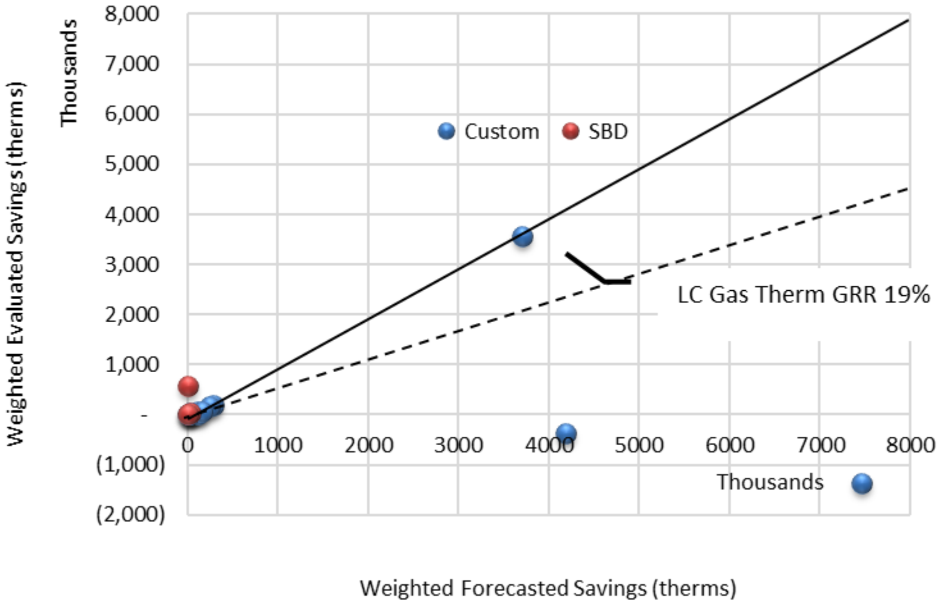


As noted above, ineligible measures and inappropriate baselines were the driving factors in the low GRR, contributing a cumulative 40% reduction in first-year energy savings. Previous evaluation cycles also found ineligible measures and adjustments to baselines to be a significant contributor to the reduction in savings. This is magnified in PY2022, as the results from PG&E heavily weigh the statewide findings. As noted above, PG&E represented approximately 83% of forecasted FY MWh savings, and had a first-year MWh GRR of 43% with a relative precision of ±17% and a lifecycle MWh GRR of 39% ±16%. PG&E's GRRs were largely impacted by differences in evaluated operating conditions and calculation methods. Two noteworthy projects were: (1) A lighting project, which forecasted approximately 3 MWh, was found to have the lighting power density (LPD) for the installed technology exceed the code allowable LPD, resulting in zero savings. (2) Another lighting project, representing 2.3 MWh of forecasted savings, was found to have had the lighting measures completely removed from the premises, also resulting in zero savings. These two projects alone represented approximately 21% of PG&E's total forecasted savings.

4.2 Gross natural gas savings and realization rates

Figure 4-5 compares the weighted forecasted and evaluated first-year gas energy savings for all Custom and SBD sites in the final sample. Like the electric scatter plots presented earlier, the colors of the markets on each plot show Custom versus SBD sites, and the diagonal dashed line indicates where each sample point would have been plotted had the forecasted estimates been 100% accurate. The scatterplot following this one focuses on dispersion of sites on the lower left quartile of this graphic. There is one project in the upper left quadrant that represents an outlier. This project is discussed further below. Overall, the lifecycle GRR was 19% and the first-year GRR was 45%. Of the 40 projects in our sample with gas impacts, five were evaluated to have no, or negative, gas savings.

Figure 4-5. Weighted Custom and SBD first-year gas energy savings scatterplot (all sites)



4.2.1 Gross savings results by subject area

Table 4-8 summarizes natural gas first-year and lifecycle forecasted savings, evaluated savings, GRR, and relative precision at the statewide level and for each subject area. We presented all results in million therms at the 90% confidence interval. Statewide, the first-year therms GRR was 45%, with a relative precision of ±9%. The Custom subject area, representing most forecasted savings (approximately 99.8%), had a first-year therms GRR of 43% with a relative precision of ±9%. The SBD subject area, representing approximately 0.2% of forecasted savings, had a first-year therms GRR of 958% with a relative precision of ±86%. The statewide lifecycle therms GRR is 19% with a relative precision of ±22%. The difference between the first-year GRR and the lifecycle GRR can be attributed to two projects which represented 35% of forecasted first-year therm and 72% of forecasted lifecycle therms. Both projects were evaluated as having negative savings. Further details are provided below the table.

Table 4-8. Statewide gross natural gas energy savings results by subject area with outlier

Subject area	First-year				Lifecycle			
	Forecasted savings [a] (million therms)	Evaluated savings (million therms)	GRR	Relative precision[b]	Forecasted savings [a] (million therms)	Evaluated savings (million therms)	GRR	Relative precision[b]
Custom	2.2	1.0	43%	±9%	16.2	2.3	14%	±10%
SBD	0.004	0.037	958%	±86%	0.1	0.7	1344%	±87%
Total	**2.3**	**1.0**	**45%**	**±9%**	**16.3**	**3.0**	**19%**	**±22%**

[a] Forecasted savings represent engineering estimates and do not include the realization rate that has been applied in savings presented in ED Tracking data.
[b] Relative precision at the 90% confidence interval.

Custom and SBD lifecycle therms GRRs are 14% and 1,344%, with relative precisions of ±10% and ±87%, respectively.

The SBD subject area GRR and relative precision results for both first-year and lifecycle are primarily being driven by one project. The evaluated savings for this project were determined using an engineering approach, versus the forecasted savings which used a modeling approach. Our engineering analysis method leveraged actual boiler gas usages from the customer to recalculate the savings. The updated savings from the installed measure were determined to be 19,339 therms compared to

76 therms from the model. The evaluator used DEER deemed database to calculate the kWh penalty from the three condensing boilers, and the kWh penalty is 1800 kWh compared to the claimed 10 kWh penalty. This difference in calculation approach resulted in a project level GRR of 25,446% for the gas savings. Because the SBD subject area had so few projects in its population (11 projects total), the results from this project weighed heavily on the overall SBD results. Results with this project removed are presented in Table 4-9.

In addition, statewide and subject area GRRs were largely influenced by ineligible projects. Ineligible projects are those that violate CPUC policy, statewide custom program rules, program rules established by their representative PA, and the installation of ineligible measures. Changes in operating conditions also had a considerable influence on GRRs across all subject areas. These include updated HOUs, efficiencies, and measure persistence. We provide additional detail in Section 4.2.3.

Table 4-9 presents the results by subject are with the previously mentioned outlier removed. These results are provided for informational purposes to further inform the reader on the impact of this one project. As seen in the table below, with the removal of the outlier project, the GRR for SBD is in line with previous evaluations and the PY2022 statewide realization rate. The impact of this project on the statewide GRR is minimal, as SDG&E accounted for a relatively small percentage of overall savings.

Table 4-9. Statewide gross natural gas energy savings results by subject area without outlier

	First-year				Lifecycle			
Subject area	Forecasted savings [a] (million therms)	Evaluated savings (million therms)	GRR	Relative precision[b]	Forecasted savings [a] (million therms)	Evaluated savings (million therms)	GRR	Relative precision[b]
Custom	2.2	1.0	43%	±9%	16.2	2.3	14%	±10%
SBD	0.004	0.002	57%	±23%	0.05	0.04	76%	±8%
Total	**2.3**	**1.0**	**44%**	**±9%**	**16.3**	**2.4**	**15%**	**±10%**

[a] Forecasted savings represent engineering estimates and do not include the realization rate that has been applied in savings presented in ED Tracking data.
[b] Relative precision at the 90% confidence interval.

4.2.2 Gross savings results by PA

Table 4-10 summarizes natural gas first-year and lifecycle forecasted savings, evaluated savings, GRR, and relative precision at the PA level. We presented all results at the 90% confidence interval.

PG&E, representing approximately 41% of forecasted therm savings, had a first-year GRR of -23% with a relative precision of ±39%. Two non-lighting projects contributed to the overall negative GRR for PG&E. These two sampled projects represented 72% of the total lifecycle forecasted therms for the population. For one project (project A), the design heat transfer rate of the new heat exchangers was slightly inefficient (about -1%) compared to the design heat transfer rate of the old heat exchangers. California does not allow regressive baselines. Further, the normalized heat transfer rate (heat transfer rate per unit area) of the new HXs is inferior to that of the old HXs. This translates to an evaluated annual energy penalty of -26,080 therms, compared to the forecasted savings of 299,214 therms. The lifecycle savings were found to be -365,120, compared to the forecasted savings of 4,190,406. For the other project (project B), the evaluation found that the overall plant operation was less efficient in the evaluation period, which resulted in an annual savings of -273,331 therms, compared to the forecasted savings of 497,485 therms. The lifecycle savings were found to be -1,366,654 therms compared to the forecasted savings of 7,462,275 therms. The discrepancies associated with these projects were noted to be inappropriate baseline selection (project A), and differences in calculation methods (project B). Additionally, the negative realization rate is being driven by lighting projects, which account for increased gas usage when installing energy efficient lighting measures. Of the 47 PG&E projects included in the sample, 24 were lighting-only projects. Of those 24 projects, 11 had evaluated negative therm impacts, while the remaining lighting projects did not have any associated gas savings.

SCG, representing approximately 56% of forecasted therm savings, had a first-year GRR of 95% with a relative precision of ±0%. The evaluation conducted a census on SCG projects, which accounts for the relative precision of 0%. Of the two projects evaluated (which represented a census for SCG), one had a GRR of 96%, while the other had a GRR of 38%. The project with the higher GRR represented 99% of the evaluated savings for SCG.

SDG&E, representing approximately 4% of forecasted therm savings, had a first-year GRR of 41% with a relative precision of ±86%. Three SDG&E projects claimed gas savings in PY2022. Of the three projects, one project in particular is influencing the GRR. As noted above, the difference in calculation approaches resulted in a project level GRR of 25,446% for the gas savings. The difference in FY GRR when compared to LC GRR is a result of an increase in evaluated EUL for this one outlier project when compared to forecasted EUL.

PG&E, SCG, and SDG&E had lifecycle therm GRRs of -10%, 94%, and 234% with relative precisions of ±19%, ±0%, and ±87%, respectively.

Table 4-10. Gross natural gas energy savings results by Program Administrator with outlier

Program Administrator[38]	First-year				Lifecycle			
	Forecasted savings [a] (million therms)	Evaluated savings (million therms)	GRR	Relative precision[b]	Forecasted savings [a] (million therms)	Evaluated savings (million therms)	GRR	Relative precision[b]
PG&E	0.9	-0.2	-23%	±39%	12.3	-1.3	-10%	±19%
SCG	1.3	1.2	95%	±0%	3.9	3.6	94%	±0%
SDG&E	0.1	0.0	41%	±86%	0.3	0.7	234%	±87%
Total	**2.3**	**1.0**	**45%**	**±9%**	**16.4**	**3.1**	**19%**	**±22%**

[a] Forecasted savings represent engineering estimates and do not include the realization rate that has been applied in savings presented in ED Tracking data.
[b] Relative precision at the 90% confidence interval.

With the outlier removed, the first-year GRR for SDG&E is 2% and the lifecycle GRR is 13%, with relative precisions of 23% and 8%, respectively.

4.2.3 Discrepancy analysis

This section presents DNV's analysis of the discrepancies that account for differences between forecasted and evaluated savings estimates for the sampled natural gas projects. Note that this analysis is based on discrepancies associated with first-year gross gas savings and has been categorized based on the factors described in Table 4-6.

When gross evaluated impacts for a project were found to be different than the forecasted savings, we recorded the associated discrepancy factors and ranked them from most to least impactful. For some projects, there was only one discrepancy factor. For example, an ineligible project (due to a policy violation or ineligible measure) would be recorded as a single discrepancy. If there were multiple factors (e.g., evaluated parameters were different than the operating parameters and adjustments to baseline conditions occurred), the discrepancies were ranked from most impactful to least impactful, and their associated impacts were recorded as percentages of savings increased or reduced. Discrepancy factors for natural gas were classified into six categories: tracking data, ineligible measures, measure counts, inappropriate baseline, operating conditions, and calculation methods.

[38] MCE did not claim any positive therm savings, as such are not presented in this table.

Figure 4-6 shows the number of instances a given discrepancy occurred, and its impact on overall gross realization rates in the electric sample.

Figure 4-6. Key drivers behind natural gas GRR

Discrepancy category	Negative impact		Positive impact		Overall	
	# Instances	Impact on GRR	Impact on GRR	# Instances	Impact on GRR	# Instances
Tracking data discrepancy	0	0%	0%	1	0%	1
Ineligible measure	2	-1%	0%	0	-1%	2
Measure count	1	-2%	0%	0	-2%	1
Inappropriate baseline	1	-15%	0%	0	-15%	1
Operating conditions	6	-1%	0%	0	-1%	6
Calculation method	4	-37%	1%	2	-36%	6
Total	**14**	**-56%**	**1%**	**3**	**-55%**	**17**

The following discrepancies were most impactful in both frequency and the degree of impact on first-year gross savings.

- **Calculation methods** – There were four projects where evaluated savings were negatively impacted by differing calculation methods, and two projects where savings were positively impacted. One project that reported this discrepancy was a new construction project where the evaluator did not use the PA provided SimCalc savings calculation model for boiler savings, because the model-reported savings were significantly low for actual installed boiler capacities and boiler consumption data provided by the customer. Evaluators used engineering analysis methods and actual boiler gas consumption data from customer to estimate the evaluated savings.
- **Inappropriate baselines** – One project was noted to have inappropriate baselines applied that negatively impacted savings. The project that reported a negative discrepancy was the heat exchanger (HX) replacement project with a regressive baseline explained in Section 4.2.2.
- **Operating conditions** – Six projects were noted as having differing operating conditions that negatively impacted evaluated savings. An example of a project that reported this discrepancy is for a new construction project where boiler hot water supply and return temperature set points in the PA model was updated based on data that was collected from the building EMS.

Table 4-11 further examines the impact of the discrepancies discussed above by showing the influence of each on the evaluated savings from the tracking estimate. The realization rate in each row is the cumulative realization rate of all adjustments made to that point (i.e., the ineligible product realization rate includes both the tracking data adjustment and the ineligible product adjustment). Explored in this way, the combined impacts of calculation methods and inappropriate baselines are clear drivers of the final gas realization rate, eroding the initial forecasted savings of 2.3 million therms by 0.8 million and 0.3 million therms, respectively.

Table 4-11. Discrepancy impacts on first-year gas savings and GRR

Discrepancy	First-year savings (x1,000 therms)	Savings change (x1,000 therms)	Realization rate
Tracking savings	2,252	N/A	N/A
Tracking data	2,252	0	100%
Ineligible project/measure	2,235	-17	99%
Inappropriate baseline	1,897	-338	84%
Measure count	1,846	-52	82%
Calculation methods	1,029	-817	46%
Operating conditions	1,014	-15	45%
Precision at 90% confidence			**±8.8%**

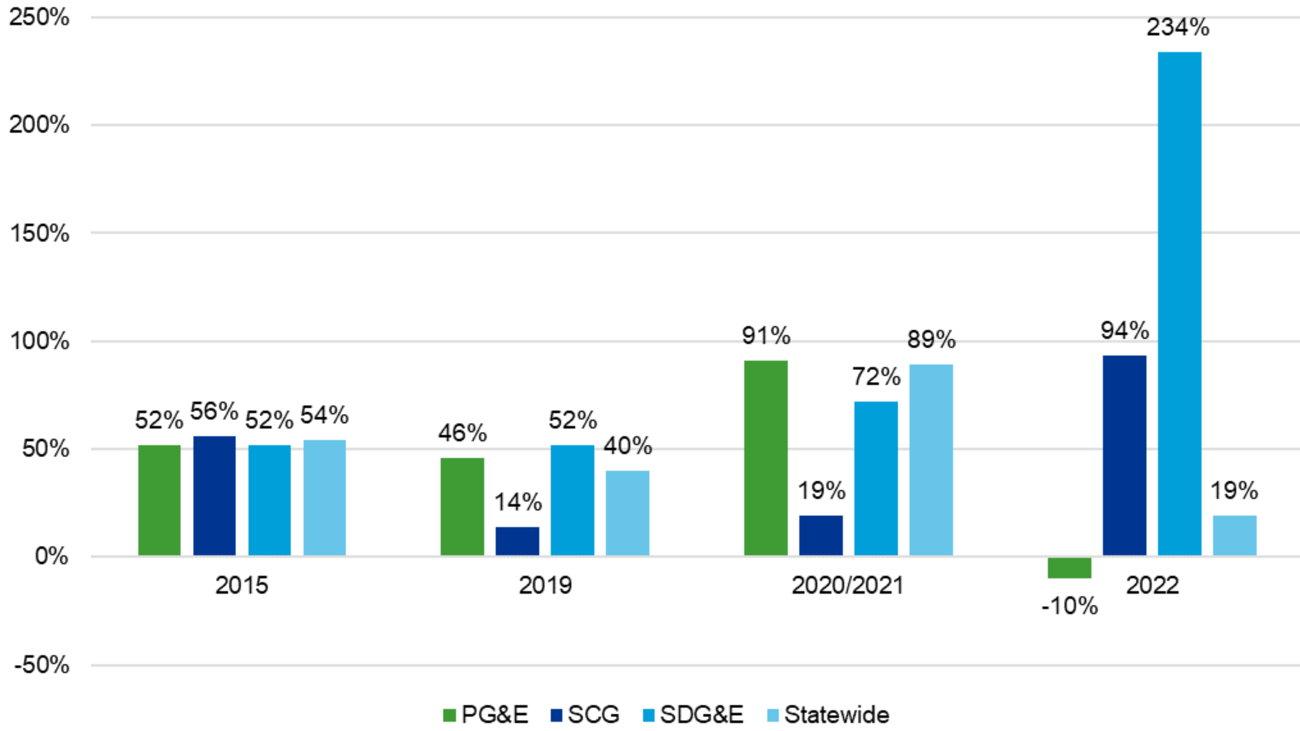
4.2.4 Comparison to previous evaluation findings

Figure 4-7 compares the PY2022 estimates of gas lifecycle GRR by PA and statewide. We found a lot of fluctuation in gas realization rates across the PAs. Some observations from this comparison are:

- PG&E's LC GRR was significantly lower (-10%) compared to the three previous cycles of 91% (2020/2021), 46% (2019), and 52% (2015). The PY2022 negative realization rate is being driven by lighting projects, which account for increased gas usage when installing energy efficient lighting measures. Of the 47 PG&E projects included in the sample, 24 were lighting-only projects. Of those 24 projects, 11 had evaluated negative therm savings, while the remaining lighting projects did not have any associated gas savings. In addition to the lighting projects, two non-lighting projects contributed to the overall negative GRR for PG&E. These two sampled projects represented 72% of the total lifecycle forecasted therms for the population. For one project, the evaluation found an annual energy penalty of -26,080 therms, compared to the forecasted savings of 299,214 therms. For the other project, the evaluation found that the overall plant operation was less efficient in the evaluation period, which resulted in an annual savings of -273,331 therms, compared to the forecasted savings of 497,485 therms.
- The SCG GRR in this study was significantly higher than last year's, but the overall population for SCG was much lower. The evaluation conducted a census on SCG projects. Of the two projects evaluated, one had a GRR of 96%, while the other had a GRR of 38%. The project with the higher GRR represented 99% of the evaluated savings for SCG.
- The SDG&E GRR in this study was 231%. Three SDG&E projects claimed gas savings in PY2022. Of the three projects, one project in particular influenced the GRR. As noted above, the difference in calculation approaches resulted in a project-level GRR of 59,494% for first-year gas savings and 33,434% for lifecycle savings.
- The statewide 2022 GRR was 19%. This value was lower than previous years, which have ranged from 89% to 40%. As noted above in Section 4.2.2, two projects in particular influenced the GRR. Differences in evaluation calculation methods and baseline assumptions continue to persist and drive savings downward. Combined, these two discrepancies account for 52% of the overall first-year gross gas savings reduction.

It should be noted, the 2020/2021 evaluated GRR of 89% included a large savings project that accounted for over 90% of all gas savings. With this project removed, the PY2020/2021 GRR was 29%.

Figure 4-7. Statewide gas energy lifecycle GRR results by program year and PA



4.3 Net savings results and ratios

4.3.1 Net electric savings results and ratios

This section presents the net electric savings results and NTGR ratios broken out by program, program administrator, measure type, and year. The major theme is that PY2022 electric NTGRs have increased significantly over PY2020-2021 levels. For example, the PY2022 NTGR for lifecycle electric energy was 56% up from the 39% NTGR estimated for PY2021 and the 34% estimated for PY2020. The lifecycle electric NTGR for PY2022 is at an all-time high.

The evaluation team could not identify any major drivers for this increase in NTGRs, but it is possible that it could be the cumulative impact of several smaller drivers. For example, the analysis in Section 4.3.5 shows that the PY2022 projects with the highest NTGRs were more likely to value the incentives, the PA staff recommendations, and the program marketing information than projects in the upper quartiles from earlier years. This section also shows that the PY2022 participants were less likely to cite non-program project drivers – such as the age of the equipment and prior experience with the measure -- than PY2021-2022 participants. This might be evidence of better project screening practices.

In addition, the reduction in the number and proportion of SBD projects in the PY2022 CIAC sample likely contributed to the higher CIAC NTGRs because the SBD projects have historically had much lower NTGRs than the custom projects. Furthermore, the PY2022 net data collection efforts had more success – in relative terms – collecting NTG estimates from lighting vs. non-lighting projects. Since lighting projects have historically had much higher NTGRs than non-lighting projects, this was likely another driver of the higher NTGRs.

Finally, as discussed in prior sections, there were also a couple of large projects with unusual savings impacts that the evaluation team chose to include in the analysis. While the inclusion of one of these "outlier" projects had little impact on the overall CIAC electric net savings NTGRs, it did have more significant impacts on some of the more granular subprogram, PA, and measure category NTGRs. In this report section the evaluation team presents the net savings results both with and without the inclusion of these outlier projects.

4.3.1.1 Net results by subject area

Table 4-12 shows net electric energy and demand savings results broken out by program with the outlier project included. The table also shows that Custom had an overall first-year NTGR of 61% for electric energy savings with a relative precision of ±7%, with a lifecycle NTGR of 56% and a relative precision of ±9%.

The first-year electric energy NTGR of the Custom program (62%) was much higher than the NTGR for the SBD program (50%) although the difference was narrower than was the case in the PY2020-2021 evaluation (e.g., 45% NTGR for Custom and 26% NTGR for SBD). As noted, due to the phaseout of the SBD program there were many fewer SBD projects in PY2022 than there had been in PY2020-2021 and the variability of results increases with small sample sizes.

Table 4-12. Net electric energy and demand savings results by program with outlier

	First-year			Lifecycle		
Program	Net savings	NTGR	Relative precision	Net savings	NTGR	Relative precision
Energy (MWh)						
Custom	6,852	62%	±7%	51,759	56%	±10%
SBD	209	50%	±22%	3,277	50%	±22%
Total	**7,024**	**61%**	**±7%**	**54,630**	**56%**	**±9%**
Demand (MW)						
Custom	0.8	64%	±5%	7.0	57%	±7%
SBD	0.1	54%	±17%	1.2	55%	±17%
Total	**0.9**	**63%**	**±5%**	**8.2**	**57%**	**±7%**

Relative precision at the 90% confidence interval.
Table note: The domain (program) NTGRs were calculated with a blend of embedded and non-embedded sample. These NTGRs were applied to the evaluated gross savings totals to derive the values in this table. Due to this expansion process, the total of the domain estimates may not equal the overall savings.

Table 4-13 shows, for informational purposes, the program-level NTGRs with the large outlier SBD project removed. The removal of this project significantly reduced the SBD program's NTGR due to the project's large savings weight. However, because the SBD program was so much smaller than the Custom program, the removal of the outlier project did not impact the overall first-year electric energy NTGR of 61%.

Table 4-13. Net electric energy and demand savings results by program without outlier

Program	First-year Net savings	First-year NTGR	First-year Relative precision	Lifecycle Net savings	Lifecycle NTGR	Lifecycle Relative precision
Energy (MWh)						
Custom	7,780	62%	±7%	53,990	56%	±10%
SBD	97	25%	±4%	1,474	25%	±4%
Total	**7,859**	**61%**	**±7%**	**54,996**	**54%**	**±10%**
Demand (MW)						
Custom	0.84	64%	±5%	0.8	57%	±7%
SBD	0.03	25%	±7%	0.1	25%	±7%
Total	**0.88**	**61%**	**±5%**	**0.9**	**52%**	**±7%**

Relative precision at the 90% confidence interval.
Table note: The domain (program) NTGRs were calculated with a blend of embedded and non-embedded sample. These NTGRs were applied to the evaluated gross savings totals to derive the values in this table. Due to this expansion process, the total of the domain estimates may not equal the overall savings.

4.3.1.2 Net results by PA

Table 4-14 breaks out the NTGRs by PA with the outlier project included. In the PY2020-2021 CIAC impact evaluation results report, the MCE and PG&E service territories had electric energy NTGRs that were much higher than the other PAs. For the PY2022 CIAC impact evaluation, while PG&E and MCE still had the highest electric energy NTGRs, the gap between these and the SDG&E NTGRs was much narrower than it had been in the previous evaluation cycle. The negative first-year net savings for SDG&E is due to the negative gross savings for this PA as noted earlier in the report. The SDG&E net savings in the first year turn positive in the lifecycle period because the EUL of the negative savings project ends and longer-lived projects with positive savings reverse the overall direction of the savings.

Table 4-14. Net electric energy and demand savings results by PA with outlier

Program Administrator	First-year Net savings	First-year NTGR	First-year Relative precision	Lifecycle Net savings	Lifecycle NTGR	Lifecycle Relative precision
Energy (MWh)						
MCE	680	59%	±8%	3,476	55%	±15%
PG&E	6,677	62%	±8%	50,109	56%	±10%
SDG&E	-212	50%	±22%	1,613	50%	±22%
Total	**7,024**	**61%**	**±7%**	**54,630**	**56%**	**±9%**
Demand (MW)						
MCE	0.04	60%	±5%	0.2	57%	±12%
PG&E	1	64%	±5%	7	57%	±7%
SDG&E	0.1	54%	±17%	1	55%	±17%
Total	**0.9**	**63%**	**±5%**	**8.2**	**57%**	**±7%**

Relative precision at the 90% confidence interval.
Table note: The domain (PA) NTGRs were calculated with a blend of embedded and non-embedded sample. These NTGRs were applied to the evaluated gross savings totals to derive the values in this table. Due to this expansion process, the total of the domain estimates may not equal the overall savings.

Table 4-15 shows electric energy and demand NTGRs after the removal of the outlier project. Its removal reduced the SDG&E NTGR significantly from 50% to 25% but had no impact on the overall first-year program NTGR.

Table 4-15. Net electric energy and demand savings results by PA without outlier

Program Administrator	First-year Net savings	First-year NTGR	First-year Relative precision	Lifecycle Net savings	Lifecycle NTGR	Lifecycle Relative precision
			Energy (MWh)			
MCE	680	59%	±8%	3,476	55%	±15%
PG&E	6,677	62%	±8%	50,109	56%	±10%
SDG&E	261	25%	±4%	1,638	25%	±4%
Total	**7,859**	**61%**	**±7%**	**54,996**	**54%**	**±10%**
			Demand (MW)			
MCE	0.04	60%	±5%	0.19	57%	±12%
PG&E	0.81	64%	±5%	6.82	57%	±7%
SDG&E	0.03	25%	±7%	0.51	25%	±7%
Total	**0.88**	**61%**	**±5%**	**7.51**	**52%**	**±7%**

Relative precision at the 90% confidence interval.
Table note: The domain (PA) NTGRs were calculated with a blend of embedded and non-embedded sample. These NTGRs were applied to the evaluated gross savings totals to derive the values in this table. Due to this expansion process, the total of the domain estimates may not equal the overall savings.

4.3.1.3 Net results by measure type

Table 4-16 presents disaggregated net savings results by measure type with the outlier project included. As was the case for the PY2020-2021 impact evaluation, the PY2022 impact evaluation found a large gap in the NTGRs between lighting and non-lighting measures.

Table 4-16. Statewide net electric energy and demand savings results by measure with outlier

Measure	First-year Net savings	First-year NTGR	First-year Relative precision	Lifecycle Net savings	Lifecycle NTGR	Lifecycle Relative precision
			Energy (MWh)			
Lighting	5,731	66%	±8%	36,183	61%	±11%
Non-lighting	1,287	46%	±20%	16,522	42%	±16%
Total	**7,024**	**61%**	**±7%**	**54,630**	**56%**	**±9%**
			Demand (MW)			
Lighting	0.6	70%	±5%	4	67%	±8%
Non-lighting	0.3	44%	±12%	4	45%	±12%
Total	**0.9**	**63%**	**±5%**	**8**	**57%**	**±7%**

Relative precision at the 90% confidence interval.
Table note: The domain (measure) NTGRs were calculated with a blend of embedded and non-embedded sample. These NTGRs were applied to the evaluated gross savings totals to derive the values in this table. Due to this expansion process, the total of the domain estimates may not equal the overall savings.

Table 4-17 shows the electric energy and demand NTGRs by measure with the outlier project removed. The biggest impact of the removal of this project was to reduce the first-year non-lighting demand NTGR from 44% to 29%. However, the impact on the first-year overall demand NTGR was negligible (reducing it from 63% to 61%)

Table 4-17. Statewide net electric energy and demand savings results by measure without outlier

Measure	First-year			Lifecycle		
	Net savings	NTGR	Relative precision	Net savings	NTGR	Relative precision
Energy (MWh)						
Lighting	5,731	66%	±8%	36,183	61%	±11%
Non-lighting	1,783	42%	±24%	13,735	32%	±19%
Total	**7,859**	**61%**	**±7%**	**54,996**	**54%**	**±10%**
Demand (MW)						
Lighting	0.59	70%	±5%	4.04	67%	±8%
Non-lighting	0.17	29%	±4%	2.36	28%	±4%
Total	**0.88**	**61%**	**±5%**	**7.51**	**52%**	**±7%**

Relative precision at the 90% confidence interval.
Table note: The domain (measure) NTGRs were calculated with a blend of embedded and non-embedded sample. These NTGRs were applied to the evaluated gross savings totals to derive the values in this table. Due to this expansion process, the total of the domain estimates may not equal the overall savings.

4.3.1.4 Comparison to previous evaluation findings

A comparison of the statewide PY2022 electric energy lifecycle NTGR results (with the outlier project included) to evaluated results from previous years (Table 4-18) shows that the 57% NTGR was the highest over the five-year period. The table also shows that MCE experienced a slight increase in its NTGRs from 2020 while both PG&E and SDG&E either tied or exceeded their maximum NTGRs from previous years. Possible drivers of these NTGR drivers are discussed in Section 4.3.1.

Table 4-18. Statewide electric energy lifecycle NTGR results by program year and PA

Program administrator[39]	2015	2019	2020	2021	2022
MCE	n/a	40%	51%	No projects in sample	55%
PG&E	53%	46%	38%	41%	56%
SCE	57%	51%	31%	23%	No projects in sample
SDG&E	50%	49%	13%	No projects in sample	50%
Statewide	**54%**	**47%**	**34%**	**39%**	**56%**

4.3.2 Net gas savings results and ratios

This section presents the net gas savings results and NTGR ratios broken out by program, program administrator, and program year. The statewide natural gas lifecycle NTGR for PY2022 hit the highest level ever achieved over the four evaluation cycles. Since SCG accounted for the vast majority of natural gas savings in PY2022, its 78% NTGR drove the overall CIAC NTGR of 76%. Most of the possible drivers of higher electric NTG factors discussed in Section 4.3 (with the exception of the changing mix of lighting NTG estimates) would be plausible drivers for the higher gas NTGRs.

4.3.2.1 Net results by subject area

Table 4-19 shows net natural gas energy savings results broken out by program with the outlier project included. The first-year and lifecycle PY2022 NTGRs for the Custom program were dramatically higher (76% in both scenarios) than they had been in

[39] For values from 2015 through 2019, source: 2019 Custom Industrial, Agricultural, and Commercial (CIAC) Impact Evaluation (Group D–D11.04), SBW Consulting, February 12, 2022, page 58.

PY2020-2021 (15% for first-year and 14% for lifecycle). For the SBD program in particular, a major driver of the higher NTGRs is the inclusion of one outlier project.

Table 4-19. Net natural gas energy savings results by program with outlier

Program	First-year			Lifecycle		
	Net savings (million therms)	NTGR	Relative precision	Net savings (million therms)	NTGR	Relative precision
Custom	0.7	76%	±0.1%	1.8	76%	±0.3%
SBD	0.02	63%	±6%	0.5	64%	±5%
Total	**0.8**	**76%**	**±0.1%**	**2.3**	**75%**	**±0.5%**

Relative precision at the 90% confidence interval.
Table note: The domain (program) NTGRs were calculated with a blend of embedded and non-embedded sample. These NTGRs were applied to the evaluated gross savings totals to derive the values in this table. Due to this expansion process, the total of the domain estimates may not equal the overall savings.

Table 4-20 shows the natural gas energy NTGRs by program with the removal of the outlier project. This removal had no impact on the overall first-year NTGR which remained at 76%. However, the removal did reduce the SBD NTGR from 63% to 26%.

Table 4-20. Net natural gas energy savings results by program without outlier

Program	First-year			Lifecycle		
	Net savings (million therms)	NTGR	Relative precision	Net savings (million therms)	NTGR	Relative precision
Custom	0.74	76%	±0.1%	1.8	76%	±0.3%
SBD	0.001	26%	±0.0%	0.011	26%	±0.0%
Total	**0.74**	**76%**	**±0.1%**	1.8	74%	±0.3%

Relative precision at the 90% confidence interval.
Table note: The domain (program) NTGRs were calculated with a blend of embedded and non-embedded sample. These NTGRs were applied to the evaluated gross savings totals to derive the values in this table. Due to this expansion process, the total of the domain estimates may not equal the overall savings.

4.3.2.2 Net results by PA

Table 4-21 presents the net natural gas energy savings NTGR results broken down by PA with the large outlier project included. SCG accounted for the vast majority of the net natural gas savings and therefore its 78% NTGR drove the overall program NTGR of 76%. MCE is showing negative net natural gas savings because it implemented many lighting projects and these projects usually have interactive effects (e.g., the natural gas HVAC systems must produce extra heat to compensate for heat formerly provided by the replaced lighting system).

Table 4-21. Net natural gas energy savings results by PA with outlier

Program Administrator	First-year			Lifecycle		
	Net savings (million therms)	NTGR	Relative precision	Net savings (million therms)	NTGR	Relative precision
MCE	-0.0001	60%	±5%	-0.0005	56%	±12%
PG&E	-0.11	49%	±8%	-0.6	45%	±27%
SCG	0.92	78%	±0%	2.8	78%	±0%
SDG&E	0.02	54%	±2%	0.4	60%	±3%
Total	**0.76**	**76%**	**±0.1%**	**2.3**	**75%**	**±0.5%**

Relative precision at the 90% confidence interval.
Table note: The domain (PA) NTGRs were calculated with a blend of embedded and non-embedded sample. These NTGRs were applied to the evaluated gross savings totals to derive the values in this table. Due to this expansion process, the total of the domain estimates may not equal the overall savings.

Table 4-22 shows the natural gas energy savings NTGRs with the outlier removed. The removal reduces the SDG&E NTGR from 54% to 48% but has almost no impact on the overall NTGR.

Table 4-22. Net natural gas energy savings results by PA without outlier

Program Administrator	First-year Net savings (million therms)	First-year NTGR	First-year Relative precision	Lifecycle Net savings (million therms)	Lifecycle NTGR	Lifecycle Relative precision
PG&E	-0.1	49%	±8%	-0.6	45%	±27%
SCG	0.9	78%	±0%	2.8	78%	±0%
SDG&E	0.001	48%	±0%	0.0	40%	±0%
Total	**0.7**	**76%**	**±0.1%**	**1.8**	**74%**	**±0.3%**

Relative precision at the 90% confidence interval.
Table note: The domain (PA) NTGRs were calculated with a blend of embedded and non-embedded sample. These NTGRs were applied to the evaluated gross savings totals to derive the values in this table. Due to this expansion process, the total of the domain estimates may not equal the overall savings.

4.3.2.3 Comparison to previous evaluation findings

Table 4-23 compares the 2022 estimates of gas lifecycle NTGRs by PA and statewide with gas lifecycle NTGRs from the 2015, 2019, and 2020-20201 evaluations. It shows that the statewide gas lifecycle NTGR for PY2022 hit the highest level ever achieved over the four evaluation cycles. As noted, this statewide NTGR was mostly driven by the SCG NTGR. However, the PY2022 lifecycle NTGR for SDG&E was also higher than previous years.

Table 4-23. Statewide gas energy lifecycle NTGR results by program year and PA

Program Administrator[17]	2015	2019	2020, 2021	2022
PG&E	0.53	0.48	0.14	0.45
SCG	0.57	0.44	0.19	0.78
SDG&E	0.50	0.51	0.29	0.60
Statewide	**0.54**	**0.48**	**0.14**	**0.75**

4.3.3 Hard-to-reach (HTR) customers

While the evaluation team had hoped to do an analysis comparing the NTGRs of HTR and non-HTR customers, this was contingent on having an adequate number of HTR projects in the PY2022 CIAC population and in the surveyed sample. Unfortunately, only four HTR projects were selected for the main gross savings sample, and the team only completed NTG interviews with two of these four projects.

4.3.4 Impacts of sustainability policy on attribution

One change that the team made in the NTG scoring for the PY2022 CIAC evaluation was how to score participants with company sustainability policies. In the PY2020-2021 CIAC evaluation, a participant's response to the question concerning the important of corporate policies in their decision-making[40] was deemed a non-program factor, which could potentially reduce their NTGR because the program attribution index 1 (PAI-1) takes the maximum value from all the non-program factors to reduce the PAI-1 factor.

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[40] "Now, using this 0-to-10 rating scale, where 0 means "Not at all important" and 10 means "Very important," please rate the importance of Corporate policy or guidelines in your decision to implement this [CUSTOM MEASURE] at this time."

However, for the PY2022 evaluation, the CPUC decided that if a participant's corporate policy was identified as a sustainable policy, it should not be counted among the group of non-program factors that fed into the PAI-1 factor. As discussed in the methodology section, this change was made to ensure compliance with CPUC Resolution E-4818, which discourages using sustainability policies against program influence. As also noted in the methodology section, it was necessary to add some questions to the Basic Rigor survey for the PY2022 CIAC evaluation because the prior version of the Basic Rigor NTG survey did not allow evaluators to distinguish between company policies that were sustainable in nature – which should not count against projects in NTG calculations – and other corporate policies that still could be scored as non-program factors.

The CPUC was interested in knowing how this change in the corporate policy scoring might impact the overall NTG scoring. The evaluation team's analysis found the impacts of this change to be very small. Only two of the 68 sites (3%) had their NTGRs altered due to this scoring change, and the program-wide NTGRs were unaltered.

The main reason for this small impact is the PAI-1 calculation method. There are a minimum of eight non-program factors and a few more that can be added depending on the responses to other survey questions. Because the PAI-1 uses the maximum value of all these non-program factor scores, the removal of the corporate sustainability policy as a non-program factor will only impact the site's NTGR if its value is greater than all the other non-program factors. Since there are so many non-program factors, this happens rarely. For example, while 20 of the PY2022 participants gave importance scores of 8 or greater for their sustainability policies, in only two instances were these scores greater than any other non-program factors.

4.3.5 Key factors influencing NTGRs

The interviewers asked the project decision-makers to rate the relative importance of various program or nonprogram factors using a 0-10 rating scale, where 0 meant "Not at all important" and 10 meant "Extremely important." Table 4-24 compares the average rating and distribution of ratings for key program and non-program factors. It shows that while project decision-makers highly valued the program rebates (7.3 average importance rating), they most valued improved product quality as a project driver (8.0). Program-provided technical assistance also scored well with the participants (6.5), but the smaller sample size (41 respondents) meant that many participants did not receive this technical assistance and therefore scored it as "not applicable."

Table 4-24. Ratings for the importance of factors on measures

Program factor	Sample size[41]	Average rating[1]	Percentage of respondents		
			Low (0 to 3)	Medium (4 to 7)	High (8 to 10)
Program factors					
Program "rebate"	66	7.3	17%	26%	58%
Program-provided technical assistance or feasibility studies	41	6.5	15%	41%	44%
Recommendation from program vendor	57	4.5	37%	40%	23%
Recommendations from PA staff	40	4.1	48%	23%	30%
Top non-program factors					
Improved product quality	60	8.0	8%	15%	77%
Age or condition of the old equipment	61	6.5	13%	36%	51%
Previous experience with this type of measure	57	6.1	23%	26%	51%

Table note: On the 11-point scale, 0 was "Not at all important(?)" and 10 was "Highly important(?)."

[41] This is the number of respondents who gave a numerical rating. It excludes those who gave responses such as "Don't know," those who refused to respond, and cases where the questions were not applicable (most commonly for SBD participants).

Table 4-25 compares projects with NTGRs in the top quartile to projects with NTGRs in the bottom quartile as to how frequently they rated various program factors highly (ratings of 8-10 on a 0-10 scale). All the PY2022 top quartile respondents gave the rebates high importance scores while only 10% of the PY2022 lower quartile participants valued the rebates. The PY2022 top quartile participants were more likely than the PY2022 bottom quartile participants to value PA staff recommendations or the program marketing materials.

The table also compares the PY2022 responses to those in PY2020-21, PY2019, and PY2015. The share of PY2022 top quartile participants valuing the rebates (100%) was at its highest level since PY2015. The PY2022 top quartile participants were also more likely to value PA staff recommendations and program marketing materials than top quartile participants from previous years although the frequency of these importance ratings (33-38%) were much lower than for the program rebates (100%).

Table 4-25. Percentage highly rating importance of program factors, by evaluation year and NTGR group[1]

NTGR factor	Highest quartile of NTGRs				Lowest quartile of NTGRs			
	2015	2019	2020-21	2022	2015	2019	2020-21	2022
Sample size[2]	52	84	47	17	52	82	46	17
Program “rebate”	100%	52%	87%	100%	50%	74%	32%	10%
Program-provided technical assistance or feasibility studies	65%	44%	47%	30%	40%	27%	22%	40%
Recommendations from PA staff	16%	13%	25%	33%	41%	0%	26%	8%
Program marketing materials	16%	25%	22%	38%	14%	16%	23%	0%

[1] Percentages represent the share of interviewees rating the factor between 8 and 10 on a 0-10 scale where 0 is “Not at all important(?)” and 10 is “Highly important(?).” Quartiles are established based on the number of projects and the value of the NTGR associated with the project.
[2] Sample sizes vary by row depending mostly on the number of respondents who gave “not applicable” responses (e.g., they never received program technical assistance, etc.).

Table 4-26 shows that the PY2022 top quartile participants were much more likely than top quartile participants from previous years to give high importance scores to improving product quality, regulatory compliance, complying with normal maintenance policies, and following vendor recommendations. It is plausible that companies and organizations who had delayed projects with product quality objectives during the COVID-19 pandemic might have seen 2022 as a safer time to implement these kinds of projects. There was also a smaller uptick in the share of PY2022 participants citing corporate policies as project drivers. A high percentage (82%) of PY2022 top quartile participants also gave high importance score for project payback considerations, although this was not much different than previous years.

The table also shows that 88% of the PY2022 bottom quartile participants reported making the decision to install the EE measures before they began discussing incentives with the PA programs. This percentage was considerably higher than the frequencies reported for the PY2020-2021 and PY2019 evaluations. In addition, only 19% of the PY2022 bottom quartile participants said that ROI/payback considerations were important project drivers compared to 82% of the PY2022 top quartile participants. Because ROI/payback considerations were so unimportant for these bottom quartile projects, there was no need to seek for or wait for incentives before the projects were “greenlighted.” Finally, the PY2022 bottom quartile participants were much more likely (50%) to give high importance scores to standard practices than those in the PY2022 top quartile (13%).

Table 4-26. Percentage highly rating importance of non-program factors, by evaluation year and NTGR group[1]

NTGR factor	Highest quartile of NTGRs				Lowest quartile of NTGRs			
	2015	2019	2020-21	2022	2015	2019	2020-21	2022
Sample size[2]	52	84	47	17	52	85	46	17
Previous program experience	37%	15%	47%	40%	52%	32%	44%	0%
Made decisions before discussion with program	4%	12%	2%	12%	88%	36%	32%	88%
Standard practices	26%	0%	28%	13%	56%	0%	57%	50%
Corporate policy	33%	33%	32%	45%	59%	36%	59%	25%
Compliance with normal maintenance/ replacement policies	15%	20%	32%	50%	38%	19%	67%	73%
Improved product quality	0%	0%	61%	83%	0%	4%	80%	94%
Regulatory compliance	0%	29%	38%	50%	0%	21%	54%	20%
Importance of age/condition of old equipment	35%	30%	41%	31%	40%	48%	93%	67%
Previous experience with energy efficiency	Not asked	24%	53%	54%	Not asked	38%	52%	31%
Vendor recommendation	Not asked	14%	36%	47%	Not asked	58%	26%	69%
Recommendation of a designer or consulting engineer	Not asked	21%	38%	33%	Not asked	11%	31%	70%
An acceptable ROI or payback	Not asked	71%	81%	82%	Not asked	85%	56%	19%

[1] Percentages represent the share of interviewees rating the factor between 8 and 10 on 0-10 scale where 0 is “Not at all important(?)” and 10 is “Highly important(?).” Quartiles are established based on the number of projects and the value of the NTGR associated with the project.
[2] Sample sizes vary by row.

4.4 Measure application type discussion

Table 4-27 compares forecasted and evaluated first-year and life cycle savings by the measure application type, including unweighted gross realization rates for kWh and therm savings. As discussed in Sections 4.1 and 4.2, the application of inappropriate baselines resulted in an overall reduction in evaluated savings as compared to forecasted savings. This was particularly evident in AR measures. Out of 43 projects that were forecasted to be ARs, evaluators found inaccuracies in the forecasted MAT for 17 projects. Among these 17 projects, evaluators found 14 projects to be NR and three projects to be BW. EUL and RUL are directly correlated to the MAT, or baseline, assigned to a project. AR measures had an unweighted first year GRR of 19% for MWh and 81% (represents increased therm consumption and not savings as the evaluated therm was a larger negative) for therms. The lifecycle GRRs for AR measures were 15% and 19% for kWh and therms, respectively.

The difference between the first-year and lifecycle MWh savings GRR was smallest for the AOE MAT (4% and 5% for FY and LC, respectively), whereas the AR MAT showed a difference between the first year and lifecycle MWh GRRs — a decline from 19% to 15%. Overall, the GRR for MWh increased from 32% for first year to a lifecycle GRR of 34%.

Table 4-27. Measure Application Type (MAT) comparison for first year and lifecycle savings (unweighted)

Measure Application Type (MAT)	Electric			Natural gas		
	Forecasted MWh	Evaluated MWh	GRR (%)	Forecasted million therm	Evaluated million therm	GRR (%)
First year savings						
AOE (Add-on Equipment)	4,382	196	4%	0.52	-0.26	-51%
AR (Accelerated Replacement)	7,941	1,523	19%	-0.01	-0.01	81%
BRO-Op	236	69	29%	0.01	0.00	0%
BRO-RCx	1,312	488	37%	1.33	1.23	93%
BW (Building Weatherization)	0	6	N/A	0.00	0.00	N/A
NC (New Construction)	9,245	4,339	47%	0.03	0.04	141%
NR (Normal Replacement)	445	915	206%	0.30	-0.03	-9%
Overall	**23,559**	**7,536**	**32%**	**2.18**	**0.97**	**45%**
Lifecycle savings						
AOE (Add-on Equipment)	52,987	2,552	5%	7.62	-1.31	-17%
AR (Accelerated Replacement)	42,208	6,391	15%	-0.16	-0.03	19%
BRO-Op	707	208	29%	0.04	0.00	0%
BRO-RCx	3,935	1,362	35%	3.99	3.69	93%
BW (Building Weatherization)	0	57	N/A	0.00	0.00	N/A
NC (New Construction)	110,660	51,049	46%	0.43	0.70	163%
NR (Normal Replacement)	5,926	11,752	198%	4.19	-0.37	-9%
Overall	216,424	73,370	34%	16.11	2.68	17%

[1] The evaluated therm is a large negative number compared to the forecasted therm and therefore, the RR represents increased therm consumption and not savings.
U.D. = undefined because the forecasted savings were zero.

4.5 Effective useful life and remaining useful life discussion

Table 4-28 provides a comparison of EUL and RUL by PA for the evaluated measures. The values presented are weighted averages based on forecasted EUL and RUL and evaluated EUL and RUL at the project level. We evaluated the two highest savings claims for each project and present the weighted average. Overall, the forecasted EULs were higher than those determined by DNV, showing a decrease from 11.8 years to 11.3 years. RULs also showed a decrease when comparing forecasted to evaluated, with the forecasted average of 3.5 years and evaluated of 2.3 years.

Table 4-28. EUL and RUL comparison by PA (weighted average)

PA	EUL comparison			
	Forecasted (years)		Evaluated (years)	
PA	**EUL**	**RUL**	**EUL**	**RUL**
PG&E	11.7	3.4	10.9	2.4
SCG	5.0	0.0	4.9	0.0
SDG&E	10.8	0.0	13.6	0.0
MCE	12.1	4.0	11.9	2.1
Average	**11.8**	**3.5**	**11.3**	**2.3**

The differences in EUL and RUL can largely be attributed to the differences in MAT, as noted in Section 3.2.2.1. This difference in EUL and RUL is a key factor in the lower evaluated lifecycle savings compared to the forecasted lifecycle savings, resulting in a lifecycle gross realization rate of less than the first-year gross realization rate. Lifecycle savings refers to the savings associated with the lifetime of an efficiency measure undertaken by a program participant. Equipment replaced early in its useful life (e.g., Accelerated Replacement) might receive reduced savings for a portion of its lifetime. For example, project PRJ – 02724720 had a forecasted EUL of 12 years and an evaluated EUL of 8.2 years. This adjustment to the EUL resulted in approximately 32% lower lifecycle savings when comparing forecasted to evaluated kWh savings.

As noted in Sections 4.1 and 4.2, there are notable differences between annual and lifecycle GRRs between program areas and PAs. This difference is likely attributed to the impact of EUL and RUL adjustments between the applicant and evaluated estimates.

4.6 Zero saver project review

Of the 72 projects that claimed electric savings included in our sample, 16 were evaluated to have no, or negative, savings. Of the 40 projects in our sample that claimed gas savings, five were evaluated to have no, or negative, gas savings. Table 4-29 provides an unweighted comparison of GRRs with and without the inclusion of projects in which no or negative savings were found. These estimates are provided for informational purposes only to illustrate the impact these projects have on the unweighted sample population. Overall, the GRR for electric demand increases from 44% and 42% to 75% and 74% for first-year and lifecycle, respectively. The GRR for electric energy increases from 32% and 34% to 51% and 57% for first-year and lifecycle, respectively. The GRR for natural gas increases from 45% and 17% to 94% and 101%, respectively.

Table 4-29. Impact of zero savers on overall GRR (unweighted)

	With zero savers			Without zero savers		
Savings unit	First-year	Lifecycle	n	First-year	Lifecycle	n
kW	44%	42%	71	75%	74%	56
kWh	32%	34%	71	51%	57%	56
Therm	45%	17%	40	94%	101%	35

Zero (or negative) saver projects were largely due to ineligible measures, differences in calculation methods and inappropriate baselines, as discussed above in Sections 4.1.4 and 4.2.3. As PAs continue to develop and adjust programs, focus should be placed on ensuring statewide guidance is followed and baselines standard practice.

5 CONCLUSIONS AND RECOMMENDATIONS

This section presents conclusions and recommendations at a statewide level applicable to all PAs. Many of the conclusions and recommendations presented below are similar to those made in prior evaluation studies. The most impactful conclusions and recommendations were included in the Executive Summary above. As such, the numbering between the Executive Summary and Section 5 may differ.

At a summary level, the recommendations are to:

- Better align forecasted and evaluated savings by:
  - Applying CPUC direction and guidance, and statewide custom program rules to screen eligible projects.
    - The evaluation found 11 instances of projects being ineligible for these reasons, resulting in zero savings for the associated claims.
  - Using appropriate calculation methods.
    - The evaluation team found that for 18 projects, calculation methods varied between the evaluated savings and the forecasted savings. These differences resulted in a reduction of 7% GRR for first-year electric savings and 37% for first-year gas savings.
  - Applying as-built building operating conditions.
  - Using appropriate baselines or standard practices to improve the savings estimation.
    - The evaluation found that 16 electric projects and 1 gas project had differing baselines when compared to the forecasted savings. This resulted in a reduction in the first-year electric energy (?) GRR of 23% and a reduction in the first-year gas GRR of 15%.
  - Performing better quality control of the projects.
  - Adjusting project savings based on post-installation inspections and M&V.
- Improve project documentation and tracking data to increase consistency between savings recorded in project files and tracking data and minimize errors in project savings claims.
- Continue to discourage free-ridership by testing program features, improving and extending project screening to all custom projects, and changing program awareness procedures to increase program-induced savings.
- Continue to educate customers on their requirements to participate in evaluation activities.
- Ensure projects are submitted to the bi-monthly CPR list on the first and third Monday of each month.

The detailed conclusions and recommendations of this evaluation are organized into the following sections:

- Overall conclusions and recommendations
- Gross impact findings and recommendations by the following research areas:
  - Custom
  - Savings by Design (SBD)
- Net impact findings and recommendations

5.1 Overall conclusions and recommendations

The following conclusions and recommendations focus on qualitative items, such as project documentation and recruitment for all research areas. We provide these recommendations to inform the PAs about items that impact evaluation timelines and outreach efforts, so the PAs can streamline evaluation requests and fulfilments in future years.

Conclusion 1. PY2022 custom program customers were unaware of evaluation participation requirements. Evaluators encountered a resistance to customer participation in the evaluation effort: Some customers asked for evidence that they had signed documentation that included a requirement to cooperate with evaluators under the terms and conditions for program participation; others agreed to participate only after their account representative intervened; yet others contacted the implementation contractor, and subsequently refused outright after hearing from the contractor that this was not a requirement. Evaluators also found a number of customers unaware that the cost reduction for their project was due to their participation in an energy efficiency program.

Recommendation 1. PAs should ensure implementation contractors, especially those who work for direct installation programs, are making participating customers aware of their program participation and their obligation to participate in evaluations as needed. Contractors should understand that they must (1) inform the customers that their project receives a public funds rebate, (2) are fully aware that customers might be required to take part in evaluation efforts, and reinforce this with customers if/when they reach out to them to confirm program requirements, and (3) obtain customer signature on Terms and Conditions documents, and submit these as part of the documentation package for each project.

Conclusion 2. Some PAs did not submit custom project applications on a bi-monthly basis for CPR selection and review in accordance with SB1131 or did not submit project applications in a timely manner. The evaluation found multiple occurrences where projects were not submitted to CMPA or were submitted late. Future program requirements may deem projects not submitted in accordance with SB1131 as ineligible if selected for evaluation.

Recommendation 2. PAs must submit signed agreements to the bi-monthly CPR list on the first and third Monday of each month. Once submitted, the CPR team may select projects from the weekly list for Custom Project Review. If selected, the project moves through the CPR process in accordance with SB1131. If not selected, the project is waived and can commence implementation.

Conclusion 3. This evaluation encountered discrepancies between the tracking data and the reported savings in the PA documentation. In five cases, tracking data discrepancies were observed resulting in difficulty tracing savings from the project documentation through to the tracking system.

Recommendation 3. The PAs should thoroughly document project files and associated calculations that align with the tracking data before sending files to the evaluators. If there are notable discrepancies, the PAs should point them out in the files and provide explanation for the discrepancies.

Conclusion 4. This study encountered instances of incorrectly applied MATs, such as RCx projects, which were documented as NR. These projects did use the correct EULs but did not have proper MATs applied, which should be flagged during project file review or engineering quality control. These are a subset of 20 occurrences of inappropriate baseline applications observed in this study. Inappropriate baselines resulted in a reduction of 22% of first-year electric savings and 15% of first-year gas savings.

Recommendation 4. PAs should apply appropriate MATs to each claim. MATs are defined in the Statewide Custom Project Guidance Document version 1.4[42] and should be used when determining the appropriate MAT.

Conclusion 5. Accelerated replacement baselines were overturned to normal replacement for a high fraction of the lighting-only projects sampled for evaluation. Specifically, PAs claimed 39 projects accelerated replacement. Based on the customer responses, the baseline was determined to be normal replacement for 15 of these (38%) projects.

Recommendation 5. PAs should complete the accelerated replacement questionnaire for all accelerated replacement projects to ensure supporting evidence is documented as defined in Resolution E:5115[43]. This can be accomplished by probing participants to verify baselines qualify as accelerated replacement before claiming savings. Projects where equipment is not providing the intended service, or where the customer was already planning a lighting project in the very near future, should not be claimed as "Accelerated Replacement."

Conclusion 6. This study encountered hardcoded or locked forecasted analysis spreadsheets. For several projects, PAs only provided hardcoded savings analysis in PDF or Excel format or provided password protected files where it was unclear to determine how savings were calculated and where inputs and assumptions were being derived. Without the native unlocked analysis spreadsheets, it was difficult to verify the forecasted savings estimate, and in some cases, forced the evaluator to create a custom savings model which may have not been necessary if the applicant-provided model was accessible and deemed viable for evaluation use.

Recommendation 6. PAs should provide native unlocked analysis files which clearly document calculations, inputs, and assumptions that match tracking reported savings as part of the evaluation data requests. This will ensure the forecasted savings can be verified and replicated readily.

Conclusion 7. Accurate customer contact information was not always present in program files. Many projects did not have accurate customer contact information, or it was missing entirely. Accurate customer contact information is crucial to gross and net recruitment. DNV recruiters often had to review project documentation to obtain new contact information. Support in recruiting efforts provided by the PAs proved to be very effective, instrumental in follow-up contact attempts, and often led to successful recruitment.

Recommendation 7. PAs should update contact information for customers on a regular basis in support of evaluations and support evaluation recruitment efforts through proactive outreach to customers selected for evaluation.

5.2 Gross savings conclusions and recommendations

In this section we provide conclusions and recommendations based on three categories: Custom non-lighting, Custom lighting, and SBD.

5.2.1 Custom

5.2.1.1 Non-lighting

The below conclusions and recommendations are specific to non-lighting projects.

Conclusion 8. Impacts of on-site generation or non-IOU delivered fuels were not consistently documented. Consistent with PY2020/2021 findings, in several projects with on-site generation of power, the PA did not consider the impacts of photo-

[42] https://file.ac/OEr-2p-bk3A/
[43] https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M366/K381/366381636.PDF

voltaic (PV) on-site generation appropriately while estimating the savings. DNV found projects where non-IOU fuels were delivered, where the PA did not adjust reported savings to only claim savings for grid impacts.

Recommendation 8. The PAs should consider the impact of the on-site generation and only claim savings for periods the customer is purchasing power from the PA. As part of the evaluation data request, PAs should provide on-site generation data for a period of no less than one year pre- and post-installation (two years total).

Conclusion 9. Installed measures must exceed baseline energy performance. Installed measures were not always above code baseline efficiency. Measures are required to be more energy efficient than the applicable code or standard practice baseline. Programs shall not include to-code measures that do not exceed code except for an NMEC or HOPPs compliant framework.

Recommendation 9. The PA should provide all necessary information to show that installed measures exceed baseline energy performance. Any measure technology that matches a DEER definition for a code baseline is considered a to-code measure (i.e., has zero savings). PAs should also work with third party (3P) implementers to ensure that they are aware of CPUC requirements, including baseline selection, incremental cost, and eligibility requirements.

Conclusion 10. The installed equipment must operate for at least five years.[44] DNV found multiple projects that had EULs of less than five years. New equipment or system retrofits must provide energy savings for a minimum of five years. This equates to lifecycle savings of at least five years for all measures.

Recommendation 10. PAs should ensure that installed equipment has lifecycle savings of at least five years.

Conclusion 11. This study encountered incorrect or outdated baseline information. Consistent with the PY2020/2021 evaluation, many sources used for baseline information were based on old and/or inaccurate information.

Recommendation 11. PAs should ensure appropriate baselines and SPs are being used at the time of project approval. If available SP studies are used, the PAs should ensure the studies are less than five years old at the time of project application and approval. Per Energy Efficiency Industry Standard Practice (ISP) Guidance document version 3.1,[45] market studies should be less than five years old. If an SP is greater than five years old, the PA should reassess the SP for continued applicability or replace with an updated standard practice.

Conclusion 12. Project extensions are not always documented as required in the customer agreement. Projects were found to have been installed past the approved installation date without contract extensions and/or lacked continuing measurement requirements in the customer agreement.

Recommendation 12. PAs should ensure that projects are installed before the approved installation date and savings are claimed within the approved installation year. If projects cannot be installed before the approved installation date, provide written extensions on an annual basis before the expiration of the agreement. At this time, the PAs should also ensure that equipment has not been ordered by seeking evidence such as the copy of dated purchase order or require invoices that show the date of purchase order. PAs should formalize the customer agreement extension process to ensure that proper procedures are followed when extensions are granted.

Conclusion 13. The evaluation found installed RCx equipment to be operating at pre-existing conditions. There were instances of projects where RCx equipment was found to be operating at pre-installation conditions. Many of these projects reverted during the periods of COVID-19 operation for reasons such as increased air ventilation requirements, building

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[44] https://www.sdge.com/sites/default/files/2019%20Customized%20Policy%20Procedure%20Manual%20VERSION1docx.pdf – Section 1.5

[45] CPUC. "Custom Projects Review Guidance Documents." https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/energy-efficiency/custom-projects-review-guidance-documents

schedules, minimum outdoor air requirements, etc., but were never re-programmed to settings as implemented to save energy, resulting in heavy reductions in evaluated savings or even zero savings in some cases.

Recommendation 13. PAs should ensure proper education on equipment and controls is provided to the customer, especially for BRO-RCx based measures. This will maximize savings and reduce the chance of equipment and control sequences being changed drastically or reverted to pre-installation conditions.

Conclusion 14. Short-term or limited data was used to inform annual savings. Consistent with the PY2020/2021 evaluation, there were several instances where PAs used short-term metered data (1 week), or spot measurements from limited parameters to extrapolate savings. This methodology is not necessarily accurate in determining savings as limited data does not inform on potential changes in load over longer durations and seasons.

Recommendation 14. PAs should consider conducting a longer-term pre- and post- installation M&V that represents a typical operation to develop more accurate savings estimates. The PAs should also normalize for production fluctuations (and other variables like weather where applicable) between pre- and post-installation periods. Consideration should be given to the level of customer incentive and specific project circumstances.

5.2.1.2 Lighting

Conclusion 15. **When using the GrowGreen calculator, PAs often overestimated the interactive impacts of installed lighting on the building HVAC equipment,** as the calculator does not account for localized weather conditions from CZ2010 data, does not use site specific equipment efficiencies, and overestimates hours.

Recommendation 15. PAs should update the GrowGreen calculator to consider local weather patterns from CZ2010 weather data and use site-specific space conditioning efficiencies to improve savings accuracy.

Conclusion 16. The GrowGreen calculator (horticultural projects) uses standard practice baseline efficacy values based on a very limited number of high intensity discharge (HID) lighting fixtures. These few fixtures do not correctly account for products that are available for purchase on the California market and that are already commonly used by growers.

Recommendation 16. The PAs should consider additional research be conducted to 1) show the appropriate lighting technology mix for growing cannabis in California, and 2) find the appropriate baseline efficacy values associated with this technology mix. The survey data collected by *Cannabis Business Times* annually provide a saturation of various technologies installed every calendar year since 2016.

Conclusion 17. CEDARS data entry errors can result in incorrect savings claims. The evaluation team found that for seven projects, savings values entered in the CEDARS system were incorrect when compared to project documentation and the evaluation findings.

Recommendation 17. PAs should conduct either manual or automated quality control processes on CEDARS inputs prior to posting claims. This should include cross verification of total savings against PA tracking systems and the CEDARS system. If discrepancies are found, the cause should be identified and rectified in a timely manner, prior to finalization of program year submissions.

Conclusion 18. The lighting end use is usually a small fraction of the total energy usage at most non-residential sites. Sometimes the MLC-predicted savings are close to (or exceed) the site energy use as provided in the Utility Usage tab of the MLC. It is not impossible for a customer to have a lighting-dedicated utility meter, especially for exterior lighting. However, when dedicated lighting end-use meters are not present, the metered account should reflect a significant post-installation usage drop largely matching the claimed savings. This was often not the case and the claimed savings continued to exceed the post-installation billed usage.

Recommendation 18. PAs should ensure that if the MLC Utility Usage tab indicates that the MLC-projected savings are close to the customer utility bill, then (1) ensure that the MLC Utility Usage tab contains the customer's total usage across all utility meters at the site, and (2) ensure that the CEDARS claim includes all utility accounts for the customer.

Conclusion 19. The evaluation team found that for accelerated replacement (AR) projects, PAs claim RUL as 1/3 of the EUL of the measure installed (RUL=4). The correct RUL is 1/3 of the EUL of the measure removed.

Recommendation 19. PAs should claim the EUL and RUL as shown in the MLC Executive Summary Reporting tab. MLC v.13 calculates the correct EUL and RUL based on rated life and HOU for both existing and proposed measures.

Conclusion 20. DEER HOU and CDF parameters for interior lighting, as referenced in the Modified Lighting Calculator (MLC) are very rarely within 25% of reported DEER HOU and CDF. Specifically, 15 out of the 43 lighting projects installed interior (non-horticultural) lighting, only three sites had evaluation-adjusted lighting HOU and CDF within 25% of DEER values. Evaluation-adjusted lighting HOU or CDF for Light Manufacturing, Small Retail, Unconditioned Warehouse and Grocery sites were all more than 25% different (high or low) than DEER values. Grocery chains with long operating hours, had much higher HOU and CDF than DEER.

Recommendation 20. Recommendation for eTRM/MLC teams: expand DEER lookup options. Add at least one option for businesses with 24/7 operation. This would require a detailed M&V study to update DEER lighting HOUs to add additional facility and fixture types.

Conclusion 21. DEER CDF parameters for exterior lighting, as referenced in the MLC, are nonzero for climate zones 1, 5, 7, and 8 – yielding nonzero kW savings. This is consistent with expected exterior lighting operation during 4-9 PM coincident peak hours for the September peak days in these climate zones. However: climate zones 4, 6, 9 and 10 also have September peak days, yet the exterior lighting CDFs are zero in these climate zones.

Recommendation 21. Recommendation for eTRM/MLC teams: ensure CDF consistency in the MLC DEER lookup tables.

5.2.2 Savings by Design (SBD)

Conclusion 22. Modeling errors in reported savings estimations: For three SBD projects that were sampled, we found modeling errors in the PA savings calculation files which had a considerable impact on their realization rates. These inaccuracies led to considerable deviations in predicted energy consumption for heating and cooling components, diverging from expected levels based on installed equipment quantities, capacities, or efficiencies.

Recommendation 22. **We recommend that the PAs improve training and quality control** by implementing a rigorous simulation model validation and vetting process before approving savings through the SBD program.

Conclusion 23. Absence of permit drawings and permit dates in PA documentation: Consistent with the PY2020/2021 evaluation, for some sampled SBD projects, there was no documentation provided by the PAs on AHJ providing building permits, application and approval dates of the building permit, and permit drawings associated with mechanical, architectural, and lighting plans. Evaluators had to spend additional resources trying to identify the AHJ and associated permit dates to ascertain the Title 24 code that would apply to the evaluated project.

Recommendation 23. When as-built specifications are not available, we recommend that the PAs include permit drawings that clearly indicate the date the permit was applied and the AHJ approving the permit within project documentation to the evaluation team.

5.3 Net savings conclusions and recommendations

Conclusion 24. The number of custom projects decreased substantially from those observed in the 2020/2021 program years. The PY2022 CIAC program had fewer than 300 projects, compared to more than 2,000 for the PY2020-2021 CIAC program.

Recommendation 24. Explore reasons for the drop-in custom project activity from the previous evaluation period. Understanding the cause of the drop-in activity may provide insights into program changes that might make the custom offering more appealing, customer needs that are not being met with the current program design, or marketplace changes that are making the program less valuable in helping customers pursue energy efficiency. The CPUC staff s planning on examining this decline in project activity as part of the evaluation of the CPR process.

Conclusion 25. Survey evidence indicates there is room for further improvement in NTG ratios.

Recommendation 25a. Better identification of projects for which incentives serve as the "tipping point" should improve NTGRs in the future. While this same recommendation appeared in the PY2020-2021 CIAC evaluation, the evidence from the PY2022 evaluation makes it more compelling. In the PY2020-2021 evaluation, 81% of the participants with top quartile NTGRs rated payback/ROI considerations important while only 56% of those in the bottom NTGR quartile did. In the PY2022 evaluation, 82% of the participants with top quartile NTGRs rated payback/ROI considerations important, while only 13% of those in the bottom NTGR quartile did. Further evidence that the PY2022 lower NTGR projects did not value the program incentives appears in the data concerning the timing of project decision-making discussed below. Because ROI/payback considerations were so unimportant for these bottom quartile projects, there was no need to seek for or wait for incentives before the projects were "greenlighted."

Recommendation 25b. The PAs should engage with customers early in the decision-making process and improve project screening practices to ensure that the decisions to go forward with the project were not already made. This recommendation also appeared in the PY2020-2021 CIAC evaluation but remains valid based on more recent survey evidence. Eighty-eight percent of the PY2022 bottom quartile participants reported making the decision to install the EE measures *before* they began discussing incentives with the PA programs. This was up from 32% for the bottom quartile participants in PY2020-2021. In contrast, only 12% of the PY2022 participants who were in the top NTGR quartile reported making such a project decision before discussing the incentives.

Conclusion 26. The change in the NTG method to remove corporate sustainability policies from the scoring of the non-program impacts had only very small impacts on NTGRs. Only two of the 68 sites (3%) had their NTGRs altered due to this scoring change, and the program-wide NTGRs were unaltered. As discussed, the main reason for this small impact is the PAI-1 calculation method. Because the PAI-1 factor uses the maximum value of many non-program factor scores, the removal of the corporate sustainability policy as a non-program factor only impacts a site's NTGR if its value is greater than all the other non-program factors – a rare occurrence.

APPENDIX A. PROJECT INELIGIBILITY CRITERIA

Table A-1. Summary of project eligibility criteria and exceptions

Ineligibility criteria	Evaluation practice	Exceptions/discussion
Tracking data shows measure installation before the program year being evaluated	Remove from the sample frame	Custom projects other than those from the NMEC, HOPPS, or Strategic Energy Management (SEM) programs for which extended measurements are required and carried into multiple program years, will be considered ineligible if the installation did not occur in the program year being evaluated. Custom project installations that occurred in Q4 of the program year immediately preceding the program year being evaluated will remain in the sample frame subject to the evaluation practice described next.
Measure installed in Q4 of the program year immediately preceding the program year being evaluated did not require measurements to true up savings	Measure ineligible for evaluation	When measurements are required to true up savings claims the M&V requirements must be specified and described in the customer agreement to allow the measure savings to be claimed in a different program year.
Measure installed prior to project approval	A measure installed prior to project approval is ineligible	Some programs such as PG&E's Advanced Pumping Efficiency Program (APEP) allow application for incentive after the project is complete and requires submission of pre- and post-test results, savings calculations, and paid invoices. Some DI projects that are identified and implemented rapidly might not have documentation to support sequential approval and installation.
Equipment ordered prior to project approval without the PA authorization	If equipment was ordered prior to project approval, the project is ineligible.	If there is documentation by the PA or implementor dated prior to equipment ordering that allowed equipment ordering prior to project approval, then the project is eligible.
Installation time limit exceeded	If the measure was not installed within the allowed installation time specified as program requirement and/or customer agreement for installation, the project is ineligible	If there is documentation by the PA for authorizing installation time extension(s) in a timely manner, then the project is eligible.
Non-regressive efficiency	If installed equipment has the same or lower efficiency than the existing equipment, the measure is ineligible.	No exceptions.
Fuel substitution test failure	If the project included fuel substitution and required a fuel substitution test (three-	If the test result was not provided, the evaluator will attempt to complete the test to confirm compliance.

Ineligibility criteria	Evaluation practice	Exceptions/discussion
	prong test prior to August 1, 2019, and two-prong test starting August 1, 2019) and failed required test, then ineligible.	
Deemed claims and non-permanent measures	Not eligible as custom savings claims	Deemed savings may be claimed with a custom project for customer convenience provided deemed incentives have been paid. Deemed measures for which custom incentives are paid shall be considered ineligible.
Non-PPP Charge paying customers	If the customer does not pay PPP charges for the sampled fuel, or savings are for fuel not sourced from a California IOU or the project is installed by a departing load customer, the project is ineligible.	No exceptions.
Lack of Required Permits	If there is no documentation of permit closure, per SB-1414, for measure that require the PA to obtain proof of permit closure, then the claim is ineligible. SB-1414.	No exceptions.
Code Year Inconsistent with the Permit Date	If the baseline code year used is inconsistent with the permit date, project savings will be calculated using the applicable code year based on the permit date	No exceptions
Rulebook and Program Rule violations	If the installed measures are not allowed per program rules, such as LED products not listed in the statewide Qualified Products List, = or no permanent measure, then the measure is ineligible.	If a deemed measure for which there is a PA program offering, claims deemed savings but uses a custom incentive, the measure is considered ineligible and will receive zero savings. If the entire claim consists of one or more ineligible deemed measures, savings will be set to zero only for the identified ineligible deemed measure, not the entire claim. If a deemed measure for which there is a PA program offering claims custom savings but uses a deemed incentive, the savings will be corrected in evaluations to the appropriate CPUC approved measure package deemed value.

Ineligibility criteria	Evaluation practice	Exceptions/discussion
SBD whole building project without required measures	SBD whole building project that does not have at least three measures applicable to two of the end uses of lighting, envelop and mechanical systems are ineligible.	No exceptions.
SBD whole building projects without required minimum savings	SBD whole building projects that do not have savings that exceed code baseline by 10% or more are ineligible.	No exceptions.
Participant declines to participate in evaluation	A participant declines two times to participate in the CPUC EM&V studies. Savings will be zeroed out as D.10.04.029 requires participants to fulfil EM&V obligations. Substitute samples will not be drawn.	No exceptions.

APPENDIX B. ELECTRIC PROJECT DISCREPANCIES

Table B-1 and Table C-1 present project-level results, including the project sample weight, measure type, forecasted and evaluated first-year savings, GRR, and primary reason for the adjustment to the forecasted savings (i.e., reason for discrepancy). Please note that each project may have included multiple claims. This table provides a high-level summary that captures the most impactful reasons for savings adjustments.

We have provided sampling weights for each project. The sampling weights reflect the number of customers in the population that a sample customer represents for given strata. The sampling weights also incorporate sample and population characteristics not used for explicit stratification.

Table B-1. Project discrepancies resulting in adjusted gross electric savings and GRR

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
MCE-2022-02-02-431	7.3	Lighting Retrofit/New-Interior-LED-General/Area Lighting	1,621	1,698	105%	**Tracking Data Discrepancy –** 2nd Baseline savings not included in tracking data but added to the project
MCE-2022-02-02-360	7.3	Lighting Retrofit/New-Interior LED Highbay	9,142	3,698	40%	**Operating Conditions –** MLC inputs modified with evaluation-adjusted HOU and CDF, which are more than 25% lower than DEER HOU and CDF. RUL=4 replaced with RUL=5 – not reflected in this spreadsheet.
MCE-2022-02-02-372	7.3	Lighting Retrofit/New-Interior LED Highbay	13,953	571	4%	**Inappropriate Baseline –** This is a normal replacement project **Operating Conditions –** Evaluation-adjusted HOU =1,580 based on actual site operation
MCE-2022-02-02-351	7.3	Lighting Retrofit/New-Interior-LED-General/Area Lighting	38,484	19,265	50%	**Operating Conditions –** Based on facility operation, the evaluation-adjusted HOU=1,390 and CDF=0.195, which are >25% lower than DEER values used in the MLC. RUL also adjusted to 4.1 years – consistent with measure life and HOU – lifecycle savings not captured here
MCE-2022-02-02-378	2.8	Lighting Retrofit/New-Exterior-LED-Pole Mounted	53,412	53,412	100%	**Calculation Methods –** No changes to First Year savings. RUL updated to reflect 1/3 of measure life for removed equipment. Lifecycle savings not captured in this tab.
MCE-2022-02-02-437	7.3	Lighting Retrofit/New-Interior LED Highbay	9,162	5,008	55%	**Operating Conditions –** The evaluation-adjusted HOU=1,525 and CDF=0.18 are more than 25% lower than DEER HOU=2,790 and CDF=0.312. RUL was adjusted to 5 (1/3 EUL of the measure

DNV Project ID	Sampling weight	Measure type	First year (kWh) Forecasted	First year (kWh) Evaluated	First year (kWh) GRR	Reason for discrepancy
						removed) – but the LC savings are not reflected in this spreadsheet.
MCE-2022-02-02-445	7.3	Lighting Retrofit/New-Interior-LED-General/Area Lighting	19,793	0	0%	**Ineligible measure –** Project is deemed ineligible as no occupancy sensors were installed. Title 24 requires that either an occupancy or vacancy sensor be used to reduce energy usage.
MCE-2022-02-02-435	7.3	Lighting Retrofit/New-Interior-LED-General/Area Lighting	20,751	10,507	51%	**Operating Conditions –** Based on facility operation, the evaluation-adjusted HOU=1,350 and CDF=0.162, which are >25% lower than DEER values used in the MLC. RUL also adjusted to 5 years – but lifecycle savings not captured here
MCE-2022-02-02-381	7.3	Lighting Retrofit/New-Exterior-LED-Canopy	26,617	26,617	100%	**Calculation Methods –** The PA claimed RUL=4. The correct value is RUL=5 based on 1/3 measure life of the equipment removed. Lifecycle calculation changes not reflected in this spreadsheet
MCE-2022-02-02-343	2.8	Lighting Retrofit/New-Exterior-LED-Wall Mounted	75,398	4,416	6%	**Inappropriate Baseline –** Measure Application Type (MAT) changed to Normal Replacement after correcting the data entry error **Calculation Methods –** The PA made a few data entry errors that over-stated the claimed savings: - used MLC output for annual savings kWh in the second baseline to populate per-unit savings kWh in the first baseline - used MLC output for annual savings kWh in the first baseline, divided by quantity, to populate per-unit savings kWh in the second baseline
MCE-2022-02-02-344	2.8	Lighting Retrofit/New-Exterior-LED-Wall Mounted	94,877	5,106	5%	**Inappropriate Baseline –** MAT changed to Normal Replacement There was a data entry error for the second baseline per-unit savings – not captured in this spreadsheet
MCE-2022-02-02-333	2.8	Lighting Retrofit/New-Exterior-LED-Pole Mounted	104,978	4,038	4%	**Inappropriate Baseline -** MAT changed to Normal Replacement after correcting the data entry error **Calculation Methods –** The PA made a few data entry errors that over-stated the claimed savings: - used MLC output for annual savings kWh in the second baseline to populate per-unit savings kWh in the first

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
						baseline - used MLC output for annual savings kWh in the first baseline, divided by quantity, to populate per-unit savings kWh in the second baseline
MCE-2022-02-02-331	2.8	Lighting Retrofit/New-Exterior-LED-Pole Mounted	105,097	3,682	4%	**Inappropriate Baseline –** MAT changed to Normal Replacement after correcting the data entry error **Calculation Methods –** The PA made a few data entry errors that over-stated the claimed savings: - used MLC output for annual savings kWh in the second baseline to populate per-unit savings kWh in the first baseline - used MLC output for annual savings kWh in the first baseline, divided by quantity, to populate per-unit savings kWh in the second baseline
MCE-2022-02-02-332	1.0	Lighting Retrofit/New-Exterior-LED-Wall Mounted	196,200	5,869	3%	**Inappropriate Baseline –** MAT changed to Normal Replacement after correcting the data entry error **Calculation Methods –** The PA made a few data entry errors that over-stated the claimed savings: - used MLC output for annual savings kWh in the second baseline to populate per-unit savings kWh in the first baseline - used MLC output for annual savings kWh in the first baseline, divided by quantity, to populate per-unit savings kWh in the second baseline
MCE-2022-02-02-398	1.0	Lighting Retrofit/New-Interior-LED-General/Area Lighting	872,865	2,711	0%	**Inappropriate Baseline –** MAT changed to Normal Replacement after correcting the data entry error **Calculation Methods –** The PA made a few data entry errors that over-stated the claimed savings: - used MLC output for annual savings kWh in the second baseline to populate per-unit savings kWh in the first baseline - used MLC output for annual savings kWh in the first baseline, divided by quantity, to populate per-unit savings kWh in the second baseline
MCE-2022-02-02-335	1.0	Lighting Retrofit/New-Exterior-LED-Wall Mounted	796,973	14,161	2%	**Inappropriate Baseline –** MAT changed to Normal Replacement after correcting the data entry error

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
						Calculation Methods – The PA made a few data entry errors that over-stated the claimed savings: - used MLC output for annual savings kWh in the second baseline to populate per-unit savings kWh in the first baseline - used MLC output for annual savings kWh in the first baseline, divided by quantity, to populate per-unit savings kWh in the second baseline
MCE-2022-02-02-368	1.0	HVAC Retrofit/New-Envelope-Windows-Install Window Film	4,323	0	0%	**Ineligible Measure –** Per Title 24, 2019, the window film installation measure would be considered as a building alteration, triggering the Title 24 requirements. Title 24 requires SHGC value of 0.35 for a window film measure. The applicant proposed window film SHGC of 0.354 is less than Title 24 requirements. Therefore, the measure is a zero saver. **Inappropriate Baseline –** MAT was modified from Accelerated Replacement to Building Weatherization, but the baseline parameters were left the same.
MCE-2022-02-02-368B1	1.0	HVAC Retrofit/New-Envelope-Windows-Install Window Film	5,505	0	0%	**Ineligible Measure –** Per Title 24, 2019, the window film installation measure would be considered as a building alteration, triggering the Title 24 requirements. Title 24 requires SHGC value of 0.35 for a window film measure. The applicant proposed window film SHGC of 0.38 is less than Title 24 requirements. Therefore, the measure is a zero saver. **Inappropriate Baseline –** MAT was modified from Accelerated Replacement to BW, but the baseline parameters were left the same.
MCE-2022-02-02-368-B2	1.0	HVAC Retrofit/New-Envelope-Windows-Install Window Film	9,487	0	0%	**Ineligible Measure –** Per Title 24, 2019, the window film installation measure would be considered as a building alteration, triggering the Title 24 requirements. Title 24 requires SHGC value of 0.35 for a window film measure. The applicant proposed window film SHGC of 0.38 is less than Title 24 requirements. Therefore, the measure is ineligible and is a zero saver.

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
PRJ - 03695208	6.2	Lighting Retrofit/New-Int-LED-General/Area Lighting	6,061	390	6%	**Inappropriate baseline –** MAT changed from Accelerated Replacement to Normal Replacement
PRJ - 03823228	6.2	Lighting Retrofit/New-Ext-LED-Wall Mounted	10,431	10,431	100%	**Calculation Methods –** The PA claimed nonzero kW savings for exterior lighting, possibly because MLC output is nonzero – suggest MLC review. RUL was also adjusted to 5 years (1/3 of measure life of equipment removed). This causes Lifecycle kWh to increase – discrepancy not captured here because this tab addresses only First Year savings.
PRJ - 03570800	6.2	Lighting Retrofit/New-Ext-LED-Pole Mounted	16,986	16,986	100%	No discrepancies
PRJ - 03770048	6.2	Lighting Retrofit/New-Int LED Highbay	48,551	48,273	99%	**Operating Conditions –** Evaluation-based CDF is more than 25% higher than DEER – mostly because facility operates 4 AM-10 PM on weekdays. **Calculation Methods –** The PA claimed Capped Direct savings only. Evaluator corrected this to reflect Capped Direct+Indirect savings. RUL also adjusted from 4 years to 2.8 years for Measure 2, but Lifecycle discrepancies are not captured in this spreadsheet.
PRJ - 03727010	6.2	Lighting Retrofit/New-Ext-LED-Pole Mounted	88,732	2,029	2%	**Inappropriate Baseline –** MAT=Accelerated Replacement. Lighting equipment was failing; customer had already done an audit and knew a replacement was needed.
PRJ - 03304830	6.2	Lighting Retrofit/New-Int-LED-General/Area Lighting	106,585	0	0%	**Ineligible measure –** The measure triggered Title 24 requirements. Shut-off controls (either occupancy or timer-based) were required as a part of the measure. The measure is ineligible and therefore, zero saver for failing to meet Title 24 requirements.
PRJ - 03203359	6.2	Lighting Retrofit/New-Int-LED-General/Area Lighting	94,624	97,723	103%	**Calculation Methods –** Claimable savings were capped due to partial usage for June entered into MLC Utility Usage tab. Claimable savings increased slightly once evaluator entered actual usage for June.
PRJ - 03203348	6.2	Lighting retrofit/new-int-Led-general/area lighting	115,294	115,294	100%	No discrepancies
PRJ - 03203363	6.2	Lighting retrofit/new-int-LED-general/area lighting	88,714	149,039	168%	**Operating Conditions –** Evaluation-based HOU=8,255 and CDF=1 were substituted in MLC and over-write DEER HOU and CDF.

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
						HOU=8,255 limits EUL=6 and RUL=2. The PA made a data entry error in per-unit 2nd baseline savings for Measure 1 (entered MLC direct 1st baseline savings/quantity instead of MLC direct+indirect 2nd baseline savings/quantity.) This reduces lifecycle savings.
PRJ - 03729136	6.2	Lighting Retrofit/New-Int-LED-General/Area Lighting	120,195	199,931	166%	**Operating Conditions –** Evaluation-based HOU=8,255 and CDF=1 were substituted in MLC and over-write DEER HOU and CDF. HOU=8,255 limits EUL=6 and RUL=2. PA made a data entry error in per-unit 2nd baseline savings for Measure 1 (entered MLC direct 1st baseline savings/quantity instead of MLC direct+indirect 2nd baseline savings/quantity.) This reduces lifecycle savings.
PRJ - 03210524	6.2	Lighting Retrofit/New-Int LED Highbay	255,101	255,089	100%	No discrepancies
PRJ - 03471266	1.0	Lighting Retrofit/New-Int LED Horticultural	2,263,638	0	0%	**Measure Count –** The Evaluator, PA, and program implementor efforts indicated that site has not been used and LEDs have been removed. **Inappropriate Baseline –** The PA did not follow the standard practice baseline development process as directed in CPUC resolution E-4939 and relied on the tool's embedded assumptions for baseline efficacies (i.e., Photosynthetic Photon Efficacy or PPE).
PRJ - 02724720	1.0	Lighting Retrofit/New-Int LED Horticultural	2,033,040	1,058,999	52%	**Inappropriate Baseline –** The PA did not follow the standard practice baseline development process as directed in CPUC resolution E-4939 and relied on the tool's embedded assumptions for baseline efficacies (i.e., Photosynthetic Photon Efficacy or PPE).
PRJ - 04069532	6.2	Lighting Retrofit/New-Ext-LED-Pole Mounted	4,397	131	3%	**Inappropriate baseline –** Project is Normal Replacement – outdoor lights were failing and customer had decided to change them before program contractor contact
PRJ - 04048230	6.2	Lighting Retrofit/New-Ext-LED-Wall Mounted	5,234	5,234	100%	No discrepancies
PRJ - 04037066	6.2	Lighting Retrofit/New-Ext-LED-Other	11,598	656	6%	**Inappropriate Baseline –** MAT changed from Accelerated Replacement to Normal Replacement **Operating Conditions –** HOU and CDF adjusted to

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
						reflect actual facility operation; this also causes an adjustment of EUL from 12 to 9.15, but lifecycle discrepancies not captured in this spreadsheet.
PRJ - 03965406	6.2	Lighting Retrofit/New-Int LED Highbay	22,841	7,783	34%	**Operating Conditions –** Evaluator used actual facility operation and adjustment factors to estimate HOU=1,695 and CDF=0.127. These are more than 25% lower than DEER.
PRJ - 03729156	6.2	Lighting Retrofit/New-Int LED Highbay	68,132	84,624	124%	**Operating Conditions –** Annual operating hours increased from DEER-assumed hours to between 5085 and 5715 hrs based on the customer reported hours and ESPI self-reported adjustment factors
PRJ - 03203373	6.2	Lighting Retrofit/New-Int LED Highbay	98,442	36,897	37%	**Inappropriate Baseline –** MAT changed from Accelerated Replacement to Normal Replacement
PRJ - 03203375	1.7	Lighting Retrofit/New-Int LED Highbay	457,854	277,271	61%	**Ineligible measure –** Measure 2 was ineligible because T24 130.1c requires auto-off controls for luminaire alterations (e.g., removing and reinstalling >10% existing luminaires, or replacing entire luminaires).
PRJ - 03169996	1.7	Lighting Retrofit/New-Int LED Horticultural	427,071	0	0%	**Inoperable Measure –** Customer is no longer at this location. New property managers confirmed that they do not have LED lights and the business is not under operation any longer
PRJ - 02334279	1.7	Lighting Retrofit/New-Ext-LED-Pole Mounted	3,083,227	496,633	16%	**Inappropriate Baseline –** Per the interview with the site contact, the MAT was overturned from Accelerated Replacement to Normal Replacement. ISP was used per the MLC to represent the baseline technology. **Operating Conditions –** The equipment operates with a timeclock from 30 minutes prior to sunrise to 30 minutes after sunset. DEER hours of 4,100 were used in the MLC to reflect the operation of the equipment.
PRJ - 03340744	1.0	Lighting Retrofit/New-Int LED Horticultural	1,722,182	1,534,408	89%	**Operating Conditions –** Direct savings decreased for flowering fixtures from 798 MWh to 728 MWh due to changes in annual operating hours. The evaluator accounted for 35 (annual) days of downtime in between harvests when rooms are being cleaned and sanitized for next cycle. Indirect savings for flowering fixture decreased from 213 MWh to 139 MWh primarily because of the

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
						decrease in operating hours (Less mechanical cooling is necessary to satisfy room load).
PRJ - 02082944	1.3	Lighting Retrofit/New-Ext-LED Highbay (for ext. loading docks and dairy free barns)	21,610	17,057	79%	**Operating conditions –** Updated the operational hours to 2,770 from 4,100.
PRJ - 01945972	1.0	Process Retrofit/New-Fan-Efficient Unit	34,324	14,411	42%	**Tracking Data Discrepancy –** Tracking savings appears to have applied a 0.9 GRR on savings that was supposed to be unadjusted. **Calculation Methods –** Evaluator used CA eTRM measure package SWPR001-02 (approved by CPUC effective 2023 however the previous revision uses the same methodology and was effective 2020) savings method and sources to estimate measure savings.
PRJ - 03099392	1.3	Process Retrofit/New-Fan-Efficient Unit	117,282	99,226	85%	**Inappropriate Baseline –** The baseline used in the savings estimate is not feasible because of the physical constraints. The only option available to the customer is the efficient case that was installed.
PRJ - 03318678	1.3	Process Compressed Air - Replace Air Compressor - To-Sp	500,319	0	0%	**Ineligible Measure –** The measure is ineligible for two reasons per the statewide manual: 1. Installed measures must exceed baseline energy performance. Measures are required to be more energy efficient than the applicable code/ISP baseline efficiency. Programs shall not include to-code measures that do not exceed code except for an NMEC or HOPPs compliant framework. Any measure technology that matches a DEER definition for a code baseline is considered a to-code measure. 2. The installed equipment must operate for at least five years. New equipment or system retrofits must provide energy savings for a minimum of 5 years. This equates to an EUL of greater than or equal to 5 years for all measures. The EUL of this to code measure is equal to the RUL of the underlying equipment, which is less than five years based on the DEER measure code.
PRJ - 03164612	1.0	Process Retrofit/New-Pumps-Vfd	1,046,663	919,793	88%	**Operating Conditions –** Based on the longer period of provided trends, there is increased motor runtime at

DNV Project ID	Sampling weight	Measure type	First year (kWh) Forecasted	First year (kWh) Evaluated	First year (kWh) GRR	Reason for discrepancy
						higher speeds compared to applicant reported assumptions, which drove down savings.
PRJ - 01552578	1.3	Commissioning-RCX Reset Control Setting-HVAC-Setpoint Change	52,975	15,783	30%	**Operating Conditions –** According to the BMS system, both AC1 and AC2 were shown to operate only on weekdays from 5 AM -9 PM. According to the analysis, the measure for AC1 was not implemented, leading to zero savings. However, for the AC2, there were savings, but reduced due to the updated occupancy schedule.
PRJ - 02927534	1.3	Process - Fans - Replace - To-Sp	122,229	0	0%	**Ineligible Measure –** The project is ineligible for two reasons per the statewide manual: 1. Installed measures must exceed baseline energy performance. Measures are required to be more energy efficient than the applicable code/ISP baseline efficiency. Programs shall not include to-code measures that do not exceed code except for an NMEC or HOPPs compliant framework. Any measure technology that matches a DEER definition for a code baseline is considered a to-code measure. 2. The installed equipment must operate for at least five years. New equipment or system retrofits must provide energy savings for a minimum of 5 years. This equates to an EUL of greater than or equal to 5 years for all measures. The EUL of this to code measure is equal to the RUL of the underlying equipment, which is less than five years.
PRJ - 02709646	1.3	Refrigeration Retrofit/New-System-Other	117,991	117,616	100%	**Operating conditions –** Evaluated operating hours are lower than applicant reported. Evaluated hours per day: 11.5 hrs for M-F, 8.5 hrs for Saturday, whereas applicant reported 12 hours per day operation for weekdays and 10 hours per day operation for Saturdays.
PRJ - 01883578	1.0	Process Retrofit/New-Efficient Motors	70,395	0	0%	**Ineligible measure –** This project did not meet the installation deadline requirements and hence it is deemed as ineligible. All projects must be installed and fully operational one year from application approval. This project was approved in July 2019 but did not file an extension till March 2022
PRJ - 03252730	1.0	Process Retrofit/New-Fan-Efficient Unit	324,285	82,632	25%	**Calculation Methods –** Per the eTRM approach, Watts/cfm was used to determine the airflow required to model the baseline as opposed to thrust (kW/lbf). The

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
						update to the kW was due to the new utility data, as well as to the updated efficiency metric.
PRJ - 04217064	1.0	Refrigeration Retrofit/New-Cases/Coolers-Other	374,523	337,527	90%	**Operating Conditions –** EMS screenshot on LT and MT trends suggest LT system suction temperature setpoint is -1.1 degrees, and for MT system is 30.2 degrees.
PRJ - 01047586	1.0	Refrigeration Retrofit/New-Condenser-Install VFD	668,919	0	0%	**Ineligible Measure –** The project is ineligible due to lack of extensions, and equipment was ordered prior to project approval through the third party program.
PRJ - 01687856	1.0	Process Retrofit/New-Compressed Air-Modify System/Configuration	3,271,190	0	0%	**Ineligible Measure –** The measure is ineligible for two reasons per the statewide manual: 1. Installed measures must exceed baseline energy performance. Measures are required to be more energy efficient than the applicable code/ISP baseline efficiency. Programs shall not include to-code measures that do not exceed code except for an NMEC or HOPPs compliant framework. Any measure technology that matches a DEER definition for a code baseline is considered a to-code measure. 2. The installed equipment must operate for at least five years. New equipment or system retrofits must provide energy savings for a minimum of 5 years. This equates to an EUL of greater than or equal to 5 years for all measures. The EUL of this to code measure is equal to the RUL of the underlying equipment, which is less than five years based on the DEER measure code.
10973264	1.0	Retro-commissioning	46,714	-166,828	-357%	**Inoperable Measure –** The evaluators conducted an on-site which resulted in new information which indicated the measures were not implemented.
10812859	1.0	Retro-commissioning	64,683	51,180	79%	**Calculation Methods –** Weather normalization of data resulted in -29%kWh impact. However, adjusting the NRE1 and NRE2 resulted in 8% increase in savings. These two adjustments combined to 21% reduction in overall kWh savings.
10905727	1.0	Interior LED Lighting - LPD 0.550 W/sf	26,462	13,398	51%	**Measure Count –** The original SBD claim is based on the construction drawings for DSA submittal but the plan was updated due to budget overrun. The administration part of

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
						the building was removed from the plan. Therefore, the total area and number of fixtures were updated and recalculated to verify the savings.
10948354	1.0	New construction whole building-Wall & roof insulation, Lighting Power Density	101,170	100,190	99%	**Calculation Methods –** Capacity and efficiency were updated to 36mbtuh and 8.5 EER and HSPF from 24 mbtuh and 13EER and 10.5 HSPF.
PRJ - 02537606	1.0	Lighting Retrofit/New-Int LED Horticultural	744,535	0	0%	**Ineligible Measure –** Per section 1.14.3 in the statewide manual, the applicant has 12 months from the application approval date to complete the work, unless annual sequential extensions are provided. For this project, extensions were not provided between January 2021 when the project was approved through CPR and July 2022 when equipment was installed.
PRJ - 02367982	1.3	Commissioning-RCX recode controls-HVAC-setpoint change	348,550	0	0%	**Ineligible measure –** This project was found to be ineligible since this project's savings were not claimed during the PA project implementation cycle. Based on the post-installation project file ("PRJ - 02367982 - POST M&V Report 112221-CONFIDENTIAL.docx"), the project implementer received confirmation that all measures had been implemented by September 2020. Further, as stated in this document, the project implementer conducted a series of remote audits of the customer's BMS to collect up-to-date data from the customer facility, the last of which was conducted in September 2020. However, the PA has listed this project as a 2022 installation and does not have any justification to support this project listing. Because of this, the evaluation approves this as a zero-saver.
PRJ - 01088978	1.0	Integrated Building-non-residential-Whole Building Approach	83,905	94,113	112%	**Operating Conditions –** The evaluation updated heating and cooling setpoints and the operating schedule.
PRJ - 02026120	1.0	Commissioning-RCX Reset Control Setting-HVAC-Schedule Change	671,991	474,288	71%	**Calculation Methods –** Evaluation-period (October 2023) trend data was used to calculate the frequency of time that the AHU supply fans were operating during the programmed unoccupied periods. The evaluator found that (collectively), the supply fans were on more often than what had been estimated in the implementer's calculation.

DNV Project ID	Sampling weight	Measure type	First year (kWh)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
PRJ - 02325104	1.3	Commissioning-RCX Reset Control Setting-HVAC-Schedule Change	126,899	113,642	90%	**Operating Conditions –** Upon reviewing as-found verified trend data, we discovered that AHU fans are not completely off during unoccupied period as claimed by the applicant. Verified trend data showed that the AHUs run at 1-20% speed during unoccupied period. This resulted in lower measure savings. We also discovered a discrepancy in the AHU occupancy operational schedule in comparison to the PA provided, resulting in a difference in savings. **Calculation Methods –** Updated peak kW calculation per DEER protocol.
PRJ - 01047047	1.3	Integrated building-non-residential-whole building approach	55,355	53,311	96%	**Operating Conditions –** Verification with site contact indicated most of the building operate 6AM-10PM but the systems in the Server Room operate 24/7 for data center cooling purposes
PRJ - 02013969	1.3	Commissioning-RCX reset control setting-HVAC-setpoint change	235,531	69,229	29%	**Operating Conditions –** Evaluators updated the 2-degree Outdoor Air Temperature (OAT) bins based on TMYx weather data and the occupancy schedule per trend data. The evaluator-collected trend data indicates greater operating hours per year than the applicant (3,654 occupied vs 3,132), increasing savings. Additionally, in building 2000, evaluated SAT values at higher OAT are higher than what the applicant submitted post SAT values are. This means lower cooling energy consumption in the post case compared to applicant submitted post and hence, higher kWh and therm savings. Evaluators updated the 2-degree OAT bins based on TMYx weather data and the occupancy schedule per trend data. The evaluators operating profile indicates only 2 peak occupied hours, while the applicant's analysis includes 9 peak occupied hours, decreasing kW savings.
PRJ - 01158516	1.3	Integrated building-non-residential-whole building approach	137,259	4,718	3%	**Calculation Methods –** In the Proposed case, a lot of hours within the year were resulting in negative electric cooling consumptions thereby overestimating savings on the space cooling energy component. Evaluators

DNV Project ID	Sampling weight	Measure type	First year (kWh) Forecasted	First year (kWh) Evaluated	First year (kWh) GRR	Reason for discrepancy
						identified that the installed system rated cooling efficiency was inappropriately modeled and instead of EER performance at ARI conditions, the forecasted savings used a comp/cond kW. This was confirmed by EnergySoft. The evaluators updated the as-built cooling efficiency issue by providing the actual ARI rated EER of the installed cooling equipment, and the model provides reasonable results that align with the intent of the space cooling measure associated with the project.
PRJ - 00990825	1.3	Integrated building-non-residential-whole building approach	243,922	275,040	113%	**Operating Conditions –** Updated parameters after site visit: Chilled water supply: 49.3 F Chilled water supply flow: 250 gpm Boiler setpoint: 118 F max AHU-1 supply temp: 56 AHU-2 supply temp: 56 Resets: AHU supply temperature reset (high 70, low 55) Boiler OSA temperature reset checked Cooling tower condenser water reset (start temp 65, max temp 77)
10704500	1.0	Whole Building	143,711	105,620	73%	**Tracking Data Discrepancy –** The building 800 model results were slightly different from the SBD documents claimed savings **Measure Count –** There was one boiler, one pump, two water heaters in the model and were updated to double quantities to match inspection photos **Operating Conditions –** 1. Cool roof reflectance was 0.7 in the model and updated to 0.63 to match product specification 2. Heating setpoint 70F, operating from 7 am to 9/10 pm and no breaks throughout the year updated to 68 F, 7am to 5pm, winter break Dec16 to Jan 2, summer break June

DNV Project ID	Sampling weight	Measure type	First year (kWh) Forecasted	First year (kWh) Evaluated	First year (kWh) GRR	Reason for discrepancy
						7 to Aug 20th. 3. The Mitsubishi split system A18 in the model was having 18.5 SEER, 9.9 EER, and 10.2 HSPF, were updated to 20.2SEER, 11.4 EER, and 10.4 HSPF.
11026886	1.0	CRRC - SR-0.7 TE-0.86	3,008	2,763	92%	**Calculation Methods –** adjustments were made to savings by removing savings from negative net consumption hours due to PV generation

APPENDIX C. NATURAL GAS PROJECT DISCREPANCIES

Table C-1. Project discrepancies resulting in adjusted gross natural gas savings and GRR

DNV Project ID	Sample weight	Measure type	First year (therm)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
PRJ - 02537606	1.0	Lighting retrofit/new-int LED horticultural	42	0	0%	**Ineligible Measure –** Per section 1.14.3 in the statewide manual, the applicant has 12 months from the application approval date to complete the work, unless annual sequential extensions are provided. For this project, extensions were not provided between January 2021 when the project was approved through CPR and July 2022 when equipment was installed.
PRJ - 02367982	1.3	Commissioning-RCX recode controls-HVAC-setpoint change	25,127	0	0%	**Ineligible measure –** This project was found to be ineligible since this project's savings were not claimed during the PA project implementation cycle. Based on the post-installation project file (“PRJ - 02367982 - POST M&V Report 112221-CONFIDENTIAL.docx”), the project implementer received confirmation that all measures had been implemented by September 2020. Further, as stated in this document, the project implementer conducted a series of remote audits of the customer’s BMS to collect up-to-date data from the customer facility, the last of which was conducted in September 2020. However, the PA has listed this project as a 2022 installation and does not have any justification to support this project listing. Because of this, the evaluation approves this as a zero-saver.
PRJ - 01088978	1.0	Integrated building-non-residential-whole building approach	5,045	2,843	56%	**Operating Conditions –** for building G, systems IDEC-G2 (and implied G1) has setpoints 68 F heating and 72 F cooling. Systems AC-G1 has setpoints 69 heating and 73 heating. Occupancy schedule is 5am-10pm, Sat, Sun, Mon-Wed. Not in operation for Thurs and Fri. **Calculation Methods –** for building G, AC-G1 capacity correction based on HVAC cutsheet. AC-G1, cooling cap corrected from 1574000 to 154700 btuh, heating cap corrected from 146000 to 195000 btuh
PRJ - 02026120	1.0	Commissioning-RCX reset control setting-HVAC-schedule change	58,614	38,136	65%	**Calculation Methods –** Evaluation-period (October 2023) trend data was used to calculate the frequency of time that the AHU supply fans were operating during the programmed unoccupied periods. The evaluator found that (collectively), the supply fans were on more often than what had been estimated in the implementer's calculation. The reason for this is unknown, but could be due to hybrid work schedule changes (occupants are manually overriding the scheduled unoccupied period) or AHUs turning on to satisfy unoccupied (set back) set points.

DNV Project ID	Sample weight	Measure type	First year (therm)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
PRJ - 02325104	1.3	Commissioning-RCX reset control setting-HVAC-schedule change	13,804	9,250	67%	**Operating Conditions –** Upon reviewing as-found verified trend data, we discovered that AHU fans are not completely off during unoccupied period as claimed by the applicant. Verified trend data showed that the AHUs run at 1-20% speed during unoccupied period. This resulted in lower measure savings. We also discovered a discrepancy in the AHU occupancy operational schedule in comparison to the PA provided, resulting in a difference in savings. • PA provided AHU schedule (occupancy schedule): 4 AM to 8 PM for AHU1 and 6 am to 8 pm for AHU2. • DNV trend data AHU schedule: 4 AM to 9 PM for both AHUs. **Calculation Methods –** Updated peak kW calculation per DEER protocol.
PRJ - 01047047	1.3	Integrated building-non-residential-whole building approach	1,613	1,613	100%	**Operating Conditions –** Schedule verification with site contact indicated most of the building operate 6AM-10PM but the systems in the Server Room operate 24/7 for data center cooling purposes. The evaluation corrected some lighting wattages (L10 and L12) based on provided cutsheet and lighting specifications.
PRJ - 02013969	1.3	Commissioning-RCX reset control setting-HVAC-setpoint change	12,515	8	0%	**Operating Conditions –** Evaluators updated the 2-degree OAT bins based on TMYx weather data and the occupancy schedule per trend data. Evaluator-collected trend data indicates greater operating hours per year than the applicant (3,654 occupied vs 3,132), increasing savings. Additionally, in building 2000, evaluated SAT values at higher OAT are higher than what the applicant submitted post SAT values are. This means lower cooling energy consumption in the post case compared to applicant submitted post and hence, higher kWh and therm savings. Evaluators updated the 2-degree OAT bins based on TMYx weather data and the occupancy schedule per trend data. The evaluators operating profile indicates only 2 peak occupied hours, while the applicant's analysis includes 9 peak occupied hours, decreasing kW savings.
PRJ - 01158516	1.3	Integrated building-non-residential-whole building approach	2,901	2,844	98%	**Operating Conditions –** Building E: occupied heating SP: 71 (as-built model has 68)occupied cooling SP: 71 (as-built model has 74) **Calculation Methods –** The major discrepancy in electric savings is due to a modeling error. In the Proposed case, a lot of hours within the year was resulting in negative electric cooling consumptions thereby overestimating savings on the space cooling energy component. Evaluators identified that the installed system rated cooling efficiency was inappropriately modeled and instead of EER performance at ARI conditions, the ex-ante modeler used a comp/cond kW. This was confirmed by EnergySoft. The evaluators fixed the as-built cooling efficiency issue by providing the actual ARI rated EER of the installed cooling equipment,

DNV Project ID	Sample weight	Measure type	First year (therm)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
						and the model provides reasonable results that align with the intent of the space cooling measure associated with the project.
PRJ - 00990825	1.3	Integrated building-non-residential-whole building approach	17,202	13,582	79%	**Operating Conditions –** Updated parameters after site visit: Chilled water supply: 49.3 F Chilled water supply flow: 250 gpm Boiler setpoint: 118 F max AHU-1 supply temp: 56 AHU-2 supply temp: 56 Resets: AHU supply temperature reset (high 70, low 55) Boiler OSA temperature reset checked Cooling tower condenser water reset (start temp 65, max temp 77)
PRJ - 02133703	1.0	Process retrofit/new-heat recovery	299,315	-26,080	-9%	**Inappropriate Baseline –** Based on the comparison between the designed conditions of the old and new HXs, the design heat transfer rate of the new HXs was slightly inefficient (about -1%) compared to the design heat transfer rate of the old HXs. Further, the normalized heat transfer rate (heat transfer rate per unit area) of the new HXs is inferior to that of the old HXs. This translates to an annual energy penalty of -26,080 therm.
PRJ - 02029385	1.0	Process retrofit/new-other gas-modify process	497,485	-273,331	-55%	**Calculation Methods –** The PA-reported savings did not align with the PA-reported performance indices and that was the first red flag for the claimed savings: 1. For Furnace 1, the PA analysis reported that the annual tons pulled went down from 127,414 tons/year in the baseline to 125,234 tons/year in the performance period. However, the annual NG usage went up from 467.6 million CF to 517.3 million CF. 2. The performance index 'NG usage per ton pulled, CF/ton' increased from 3,670 CF/ton to 4,131 CF/ton. This indicates that the performance period operation is inefficient. 3. However, the ex ante analysis reported positive savings (563,176 therm/year) which is counter-intuitive to the worsened 'NG usage per ton pulled, CF/ton' and increased 'annual NG usage' and is not correct. The evaluated analysis obtained similar trends for these two performance indices and the evaluated regression model also resulted in negative savings for Furnace 1, which validated Furnace 1 performance. The baseline period in the PA model was only 60 days while the performance period was only 35 days. These limited periods most likely do not capture the full range of operating modes of the system. Further, the PA model basis for the fuel

DNV Project ID	Sample weight	Measure type	First year (therm)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
						substitution claim was invalid since the controller did not affect the usage of furnace Boost kWh.
12300643	1.0	Steam - Condensate Recovery	22,817	8,662	38%	**Calculation Methods –** The PA estimated savings were incorrect and did not relate to the site operation. The PA analysis estimated the annual condensate flow rate that was recovered and multiplied that by the difference of enthalpy of steam and condensate. This assumed that the said amount of steam was lost in the baseline operation and was recovered with the installed measure. The baseline operation did not have any steam loss. In fact, the steam headers going to various heating applications were carrying condensate along with the steam. As the wet steam has a lower heat capacity than the dry steam, the baseline operation had a higher demand for steam (wet steam) than that would have required using dry steam. By recovering the condensate from these steam headers, the steam demands for various heating applications were reduced and condensate was brought back to the boiler. In fact, the heat of this recovered condensate was the savings on the boiler. There was no facility data to estimate the recovered condensate rate. The evaluation estimated the flow rate through seven 3/16 inch steam traps in 100 psig steam headers and determined the annual condensate flow rate that possibly be brought back to the boiler as recovered heat. The savings are estimated as the difference between the energy required to heat up boiler feed water between makeup city water and condensate temperatures. In the absence of this recovered condensate, the boilers would have heated the city water to the boiler feed water temperature (i.e. condensate temperature). Thus, the PA differential (steam enthalpy and condensate enthalpy) used in the savings estimation is incorrect.
12232350	1.0	Steam - Steam Traps	1,233,853	1,184,205	96%	**Measure Count –** The ex-ante calculators claimed 959 traps were replaced/repaired whereas the documentation from the site contact shows only 930 traps were replaced/repaired.
10704500	1.0	Whole Building	2,830	1,939	69%	**Tracking Data Discrepancy –** The building 800 model results were slightly different from the SBD documents claimed savings **Measure Count –** There was one boiler, one pump, two water heaters in the model and were updated to double quantities to match inspection photos **Operating Conditions –** 1. Cool roof reflectance was 0.7 in the model and updated to 0.63 to match product specification 2. Heating setpoint 70F, operating from 7 am to 9/10 pm and no breaks throughout the year updated to 68 F, 7am to 5pm, winter break Dec16 to Jan 2, summer break June 7 to Aug 20th. 3. The Mitsubishi split system A18 in the model was having 18.5 SEER, 9.9 EER, and 10.2 HSPF, were updated to 20.2SEER, 11.4 EER, and 10.4 HSPF.

DNV Project ID	Sample weight	Measure type	First year (therm)			Reason for discrepancy
			Forecasted	Evaluated	GRR	
11026886	1.0	CRRC - SR-0.7 TE-0.86	191	0	0%	**Calculation Methods –** adjustments made to measure 1 savings by removing savings from negative net consumption hours due to PV generation
10927617	1.0	Roof Insulation, U=0.05, R=21.4	76	19,339	25446%	**Calculation Methods –** Evaluators did not utilize the ex-ante SimCalc model for boiler savings since the estimated ex-ante savings were significantly low for installed boiler capacities and actual boiler usages. Evaluators used engineering analysis methods and actual boiler gas usages from customer to recalculate the savings. The updated savings from high efficiency boilers are 15,947 therms compared to 130 therms from the model. The evaluator used DEER v2020 database to calculate the kwh penalty from the three condensing boilers, and the kwh penalty is 1800 kwh compared to the claimed 10 kwh penalty.

Gross Lifecycle Savings (MWh)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
MCE	CUSTOM-Lighting Only	17,732	6,232	0.35	0.0%	0.35
MCE	CUSTOM-OthNetNon-samp	360	57	0.16	0.0%	0.16
MCE	**Total**	**18,092**	**6,289**	**0.35**	**0.0%**	**0.35**
PGE	CUSTOM-Lighting Only	121,033	53,002	0.44	0.0%	0.44
PGE	CUSTOM-Other	94,698	35,748	0.38	0.0%	0.38
PGE	**Total**	**215,731**	**88,750**	**0.41**	**0.0%**	**0.41**
RCEA	Non-sampled	508	226	0.44	0.0%	0.44
RCEA	**Total**	**508**	**226**	**0.44**	**0.0%**	**0.44**
SCG	CUSTOM-Other	0	0			
SCG	Non-sampled	0	0			
SCG	**Total**	**0**	**0**			
SDGE	CUSTOM-Other	2,425	-3,305	-1.36	0.0%	-1.36
SDGE	SBD-Other	6,104	6,508	1.07	0.0%	1.07
SDGE	**Total**	**8,529**	**3,203**	**0.38**	**0.0%**	**0.38**
	Statewide	***242,860***	***98,467***	***0.41***	***0.0%***	***0.41***

Net Lifecycle Savings (MWh)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
MCE	CUSTOM-Lighting Only	16,102	4,010	0.25	0.0%	0.91	0.64	0.91	0.64
MCE	CUSTOM-OthNetNon-samp	216	56	0.26	0.0%	0.60	0.99	0.60	0.99
MCE	**Total**	**16,318**	**4,066**	**0.25**	**0.0%**	**0.90**	**0.65**	**0.90**	**0.65**
PGE	CUSTOM-Lighting Only	92,758	35,520	0.38	0.0%	0.77	0.67	0.77	0.67
PGE	CUSTOM-Other	62,878	23,958	0.38	0.0%	0.66	0.67	0.66	0.67
PGE	**Total**	**155,637**	**59,478**	**0.38**	**0.0%**	**0.72**	**0.67**	**0.72**	**0.67**
RCEA	Non-sampled	447	160	0.36	0.0%	0.88	0.71	0.88	0.71
RCEA	**Total**	**447**	**160**	**0.36**	**0.0%**	**0.88**	**0.71**	**0.88**	**0.71**
SCG	CUSTOM-Other	0	0						
SCG	Non-sampled	0	0						
SCG	**Total**	**0**	**0**						
SDGE	CUSTOM-Other	2,425	-1,803	-0.74	0.0%	1.00	0.55	1.00	0.55
SDGE	SBD-Other	4,257	3,550	0.83	0.0%	0.70	0.55	0.70	0.55
SDGE	**Total**	**6,682**	**1,747**	**0.26**	**0.0%**	**0.78**	**0.55**	**0.78**	**0.55**
	Statewide	***179,084***	***65,451***	***0.37***	***0.0%***	***0.74***	***0.66***	***0.74***	***0.66***

Gross Lifecycle Savings (MW)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
MCE	CUSTOM-Lighting Only	1.2	0.3	0.25	0.0%	0.25
MCE	CUSTOM-OthNetNon-samp	0.1	0.0	0.84	0.0%	0.84
MCE	**Total**	**1.2**	**0.3**	**0.27**	**0.0%**	**0.27**
PGE	CUSTOM-Lighting Only	10.8	5.7	0.53	0.0%	0.53
PGE	CUSTOM-Other	15.4	6.2	0.40	0.0%	0.40
PGE	**Total**	**26.2**	**11.9**	**0.45**	**0.0%**	**0.45**
RCEA	Non-sampled	0.1	0.0	0.52	0.0%	0.52
RCEA	**Total**	**0.1**	**0.0**	**0.52**	**0.0%**	**0.52**
SCG	CUSTOM-Other	0.0	0.0			
SCG	Non-sampled	0.0	0.0			
SCG	**Total**	**0.0**	**0.0**			
SDGE	CUSTOM-Other	0.0	0.0			
SDGE	SBD-Other	1.9	2.2	1.13	0.0%	1.13
SDGE	**Total**	**1.9**	**2.2**	**1.13**	**0.0%**	**1.13**
	Statewide	***29.4***	***14.4***	***0.49***	***0.0%***	***0.49***

Net Lifecycle Savings (MW)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
MCE	CUSTOM-Lighting Only	1.0	0.2	0.19	0.0%	0.87	0.65	0.87	0.65
MCE	CUSTOM-OthNetNon-samp	0.0	0.0	1.54	0.0%	0.55	1.01	0.55	1.01
MCE	**Total**	**1.0**	**0.2**	**0.22**	**0.0%**	**0.85**	**0.70**	**0.85**	**0.70**
PGE	CUSTOM-Lighting Only	8.0	4.0	0.50	0.0%	0.74	0.69	0.74	0.69
PGE	CUSTOM-Other	10.3	4.3	0.42	0.0%	0.67	0.69	0.67	0.69
PGE	**Total**	**18.2**	**8.2**	**0.45**	**0.0%**	**0.70**	**0.69**	**0.70**	**0.69**
RCEA	Non-sampled	0.0	0.0	0.57	0.0%	0.69	0.75	0.69	0.75
RCEA	**Total**	**0.0**	**0.0**	**0.57**	**0.0%**	**0.69**	**0.75**	**0.69**	**0.75**
SCG	CUSTOM-Other	0.0	0.0						
SCG	Non-sampled	0.0	0.0						
SCG	**Total**	**0.0**	**0.0**						
SDGE	CUSTOM-Other	0.0	0.0						
SDGE	SBD-Other	1.4	1.3	0.94	0.0%	0.72	0.59	0.72	0.59
SDGE	**Total**	**1.4**	**1.3**	**0.94**	**0.0%**	**0.72**	**0.59**	**0.72**	**0.59**
	Statewide	***20.7***	***9.8***	***0.47***	***0.0%***	***0.70***	***0.68***	***0.70***	***0.68***

Gross Lifecycle Savings (MTherms)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
MCE	CUSTOM-Lighting Only	-114	-18	0.16	0.0%	0.16
MCE	CUSTOM-OthNetNon-samp	-5	-4	0.87	0.0%	0.87
MCE	**Total**	**-119**	**-23**	**0.19**	**0.0%**	**0.19**
PGE	CUSTOM-Lighting Only	-114	-67	0.59	0.0%	0.59
PGE	CUSTOM-Other	11,915	-1,189	-0.10	0.0%	-0.10
PGE	**Total**	**11,801**	**-1,256**	**-0.11**	**0.0%**	**-0.11**
RCEA	Non-sampled	-7	-2	0.38	0.0%	0.38
RCEA	**Total**	**-7**	**-2**	**0.38**	**0.0%**	**0.38**
SCG	CUSTOM-Other	3,475	3,611	1.04	0.0%	1.04
SCG	Non-sampled	5	74	14.93	0.0%	14.93
SCG	**Total**	**3,480**	**3,685**	**1.06**	**0.0%**	**1.06**
SDGE	CUSTOM-Other	250	0	0.00	0.0%	0.00
SDGE	SBD-Other	48	724	14.93	0.0%	14.93
SDGE	**Total**	**298**	**724**	**2.43**	**0.0%**	**2.43**
	Statewide	***15,454***	***3,128***	***0.20***	***0.0%***	***0.20***

Net Lifecycle Savings (MTherms)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
MCE	CUSTOM-Lighting Only	-103	-12	0.11	0.0%	0.91	0.65	0.91	0.65
MCE	CUSTOM-OthNetNon-samp	-3	-4	1.46	0.0%	0.60	1.01	0.60	1.01
MCE	**Total**	**-106**	**-16**	**0.15**	**0.0%**	**0.89**	**0.72**	**0.89**	**0.72**
PGE	CUSTOM-Lighting Only	-103	-36	0.35	0.0%	0.90	0.54	0.90	0.54
PGE	CUSTOM-Other	8,733	-643	-0.07	0.0%	0.73	0.54	0.73	0.54
PGE	**Total**	**8,630**	**-679**	**-0.08**	**0.0%**	**0.73**	**0.54**	**0.73**	**0.54**
RCEA	Non-sampled	-6	-2	0.34	0.0%	0.87	0.78	0.87	0.78
RCEA	**Total**	**-6**	**-2**	**0.34**	**0.0%**	**0.87**	**0.78**	**0.87**	**0.78**
SCG	CUSTOM-Other	1,738	2,979	1.71	0.0%	0.50	0.83	0.50	0.83
SCG	Non-sampled	2	51	20.38	0.0%	0.50	0.68	0.50	0.68
SCG	**Total**	**1,740**	**3,029**	**1.74**	**0.0%**	**0.50**	**0.82**	**0.50**	**0.82**
SDGE	CUSTOM-Other	250	0	0.00	0.0%	1.00		1.00	
SDGE	SBD-Other	37	426	11.61	0.0%	0.76	0.59	0.76	0.59
SDGE	**Total**	**286**	**426**	**1.49**	**0.0%**	**0.96**	**0.59**	**0.96**	**0.59**
	Statewide	***10,544***	***2,758***	***0.26***	***0.0%***	***0.68***	***0.88***	***0.68***	***0.88***

Gross First Year Savings (MWh)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
MCE	CUSTOM-Lighting Only	3,637	1,141	0.31	0.0%	0.31
MCE	CUSTOM-OthNetNon-samp	33	6	0.17	0.0%	0.17
MCE	**Total**	**3,670**	**1,147**	**0.31**	**0.0%**	**0.31**
PGE	CUSTOM-Lighting Only	14,919	7,562	0.51	0.0%	0.51
PGE	CUSTOM-Other	9,080	3,205	0.35	0.0%	0.35
PGE	**Total**	**23,999**	**10,767**	**0.45**	**0.0%**	**0.45**
RCEA	Non-sampled	103	50	0.49	0.0%	0.49
RCEA	**Total**	**103**	**50**	**0.49**	**0.0%**	**0.49**
SCG	CUSTOM-Other	0	0			
SCG	Non-sampled	0	0			
SCG	**Total**	**0**	**0**			
SDGE	CUSTOM-Other	808	-851	-1.05	0.0%	-1.05
SDGE	SBD-Other	423	422	1.00	0.0%	1.00
SDGE	**Total**	**1,231**	**-429**	**-0.35**	**0.0%**	**-0.35**
	Statewide	***29,003***	***11,535***	***0.40***	***0.0%***	***0.40***

Net First Year Savings (MWh)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
MCE	CUSTOM-Lighting Only	3,302	734	0.22	0.0%	0.91	0.64	0.91	0.64
MCE	CUSTOM-OthNetNon-samp	20	4	0.19	0.0%	0.60	0.64	0.60	0.64
MCE	**Total**	**3,321**	**738**	**0.22**	**0.0%**	**0.91**	**0.64**	**0.91**	**0.64**
PGE	CUSTOM-Lighting Only	11,990	5,068	0.42	0.0%	0.80	0.67	0.80	0.67
PGE	CUSTOM-Other	5,849	2,148	0.37	0.0%	0.64	0.67	0.64	0.67
PGE	**Total**	**17,839**	**7,216**	**0.40**	**0.0%**	**0.74**	**0.67**	**0.74**	**0.67**
RCEA	Non-sampled	91	36	0.39	0.0%	0.88	0.71	0.88	0.71
RCEA	**Total**	**91**	**36**	**0.39**	**0.0%**	**0.88**	**0.71**	**0.88**	**0.71**
SCG	CUSTOM-Other	0	0						
SCG	Non-sampled	0	0						
SCG	**Total**	**0**	**0**						
SDGE	CUSTOM-Other	808	-464	-0.57	0.0%	1.00	0.55	1.00	0.55
SDGE	SBD-Other	297	230	0.78	0.0%	0.70	0.55	0.70	0.55
SDGE	**Total**	**1,105**	**-234**	**-0.21**	**0.0%**	**0.90**	**0.55**	**0.90**	**0.55**
	Statewide	***22,356***	***7,755***	***0.35***	***0.0%***	***0.77***	***0.67***	***0.77***	***0.67***

Gross First Year Savings (MW)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
MCE	CUSTOM-Lighting Only	0.1	0.1	0.49	0.0%	0.49
MCE	CUSTOM-OthNetNon-samp	0.0	0.0	0.92	0.0%	0.92
MCE	**Total**	**0.1**	**0.1**	**0.51**	**0.0%**	**0.51**
PGE	CUSTOM-Lighting Only	1.1	0.8	0.68	0.0%	0.68
PGE	CUSTOM-Other	1.3	0.5	0.35	0.0%	0.35
PGE	**Total**	**2.5**	**1.3**	**0.51**	**0.0%**	**0.51**
RCEA	Non-sampled	0.0	0.0	0.70	0.0%	0.70
RCEA	**Total**	**0.0**	**0.0**	**0.70**	**0.0%**	**0.70**
SCG	CUSTOM-Other	0.0	0.0			
SCG	Non-sampled	0.0	0.0			
SCG	**Total**	**0.0**	**0.0**			
SDGE	CUSTOM-Other	0.0	0.0			
SDGE	SBD-Other	0.1	0.1	1.05	0.0%	1.05
SDGE	**Total**	**0.1**	**0.1**	**1.05**	**0.0%**	**1.05**
	Statewide	***2.7***	***1.5***	***0.53***	***0.0%***	***0.53***

Net First Year Savings (MW)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
MCE	CUSTOM-Lighting Only	0.1	0.0	0.35	0.0%	0.90	0.65	0.90	0.65
MCE	CUSTOM-OthNetNon-samp	0.0	0.0	1.01	0.0%	0.60	0.65	0.60	0.65
MCE	**Total**	**0.1**	**0.0**	**0.37**	**0.0%**	**0.89**	**0.65**	**0.89**	**0.65**
PGE	CUSTOM-Lighting Only	0.9	0.5	0.61	0.0%	0.78	0.69	0.78	0.69
PGE	CUSTOM-Other	0.9	0.3	0.37	0.0%	0.65	0.69	0.65	0.69
PGE	**Total**	**1.8**	**0.9**	**0.49**	**0.0%**	**0.71**	**0.69**	**0.71**	**0.69**
RCEA	Non-sampled	0.0	0.0	0.60	0.0%	0.87	0.75	0.87	0.75
RCEA	**Total**	**0.0**	**0.0**	**0.60**	**0.0%**	**0.87**	**0.75**	**0.87**	**0.75**
SCG	CUSTOM-Other	0.0	0.0						
SCG	Non-sampled	0.0	0.0						
SCG	**Total**	**0.0**	**0.0**						
SDGE	CUSTOM-Other	0.0	0.0						
SDGE	SBD-Other	0.1	0.1	0.86	0.0%	0.72	0.59	0.72	0.59
SDGE	**Total**	**0.1**	**0.1**	**0.86**	**0.0%**	**0.72**	**0.59**	**0.72**	**0.59**
	Statewide	***2.0***	***1.0***	***0.51***	***0.0%***	***0.72***	***0.68***	***0.72***	***0.68***

Gross First Year Savings (MTherms)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
MCE	CUSTOM-Lighting Only	-8	-3	0.39	0.0%	0.39
MCE	CUSTOM-OthNetNon-samp	0	0	0.96	0.0%	0.96
MCE	**Total**	**-9**	**-4**	**0.42**	**0.0%**	**0.42**
PGE	CUSTOM-Lighting Only	-22	-19	0.85	0.0%	0.85
PGE	CUSTOM-Other	897	-193	-0.22	0.0%	-0.22
PGE	**Total**	**876**	**-211**	**-0.24**	**0.0%**	**-0.24**
RCEA	Non-sampled	-1	-1	0.74	0.0%	0.74
RCEA	**Total**	**-1**	**-1**	**0.74**	**0.0%**	**0.74**
SCG	CUSTOM-Other	1,131	1,193	1.05	0.0%	1.05
SCG	Non-sampled	0	3	10.64	0.0%	10.64
SCG	**Total**	**1,131**	**1,196**	**1.06**	**0.0%**	**1.06**
SDGE	CUSTOM-Other	83	0	0.00	0.0%	0.00
SDGE	SBD-Other	3	37	10.64	0.0%	10.64
SDGE	**Total**	**87**	**37**	**0.42**	**0.0%**	**0.42**
	Statewide	***2,084***	***1,017***	***0.49***	***0.0%***	***0.49***

Net First Year Savings (MTherms)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
MCE	CUSTOM-Lighting Only	-7	-2	0.28	0.0%	0.90	0.65	0.90	0.65
MCE	CUSTOM-OthNetNon-samp	0	0	1.04	0.0%	0.60	0.65	0.60	0.65
MCE	**Total**	**-8**	**-2**	**0.31**	**0.0%**	**0.89**	**0.65**	**0.89**	**0.65**
PGE	CUSTOM-Lighting Only	-20	-10	0.51	0.0%	0.91	0.54	0.91	0.54
PGE	CUSTOM-Other	650	-104	-0.16	0.0%	0.72	0.54	0.72	0.54
PGE	**Total**	**631**	**-114**	**-0.18**	**0.0%**	**0.72**	**0.54**	**0.72**	**0.54**
RCEA	Non-sampled	-1	-1	0.66	0.0%	0.87	0.78	0.87	0.78
RCEA	**Total**	**-1**	**-1**	**0.66**	**0.0%**	**0.87**	**0.78**	**0.87**	**0.78**
SCG	CUSTOM-Other	566	984	1.74	0.0%	0.50	0.83	0.50	0.83
SCG	Non-sampled	0	2	14.53	0.0%	0.50	0.68	0.50	0.68
SCG	**Total**	**566**	**986**	**1.74**	**0.0%**	**0.50**	**0.82**	**0.50**	**0.82**
SDGE	CUSTOM-Other	83	0	0.00	0.0%	1.00		1.00	
SDGE	SBD-Other	3	22	8.26	0.0%	0.76	0.59	0.76	0.59
SDGE	**Total**	**86**	**22**	**0.25**	**0.0%**	**0.99**	**0.59**	**0.99**	**0.59**
	Statewide	***1,273***	***890***	***0.70***	***0.0%***	***0.61***	***0.88***	***0.61***	***0.88***

Per Unit (Quantity) Gross Energy Savings (kWh)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
MCE	CUSTOM-Lighting Only	0	100.0%	100.0%	12.0	1,394.5	255.3	116.2
MCE	CUSTOM-OthNetNon-samp	0	100.0%	100.0%	15.0	14,137.5	1,413.8	942.5
PGE	CUSTOM-Lighting Only	0	51.4%	51.4%	11.6	3.4	0.5	0.3
PGE	CUSTOM-Other	0	7.3%	7.3%	11.2	3.5	0.3	0.3
RCEA	Non-sampled	0	100.0%	100.0%	11.7	853.4	190.2	72.5
SCG	CUSTOM-Other	0	0.0%	0.0%	5.0	0.0	0.0	0.0
SCG	Non-sampled	0	0.0%	0.0%	15.6	0.0	0.0	0.0
SDGE	CUSTOM-Other	0	0.0%	0.0%	3.0	-367,230.1	-94,522.8	-122,410.0
SDGE	SBD-Other	0	0.0%	0.0%	12.4	542,321.8	35,161.7	37,550.0

Per Unit (Quantity) Gross Energy Savings (Therms)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
MCE	CUSTOM-Lighting Only	0	100.0%	100.0%	12.0	-4.1	-0.7	-0.3
MCE	CUSTOM-OthNetNon-samp	0	100.0%	100.0%	15.0	-1,095.5	-109.6	-73.0
PGE	CUSTOM-Lighting Only	0	51.4%	51.4%	11.6	0.0	0.0	0.0
PGE	CUSTOM-Other	0	7.3%	7.3%	11.2	-0.1	0.0	0.0
RCEA	Non-sampled	0	100.0%	100.0%	11.7	-9.3	-3.8	-0.8
SCG	CUSTOM-Other	0	0.0%	0.0%	5.0	1,805,325.2	596,433.5	587,551.1
SCG	Non-sampled	0	0.0%	0.0%	15.6	9,283.9	401.2	562.7
SDGE	CUSTOM-Other	0	0.0%	0.0%	3.0	0.0	0.0	0.0
SDGE	SBD-Other	0	0.0%	0.0%	12.4	60,322.7	3,056.8	4,287.4

Per Unit (Quantity) Net Energy Savings (kWh)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
MCE	CUSTOM-Lighting Only	0	100.0%	100.0%	12.0	897.2	164.3	74.8
MCE	CUSTOM-OthNetNon-samp	0	100.0%	100.0%	15.0	14,056.8	909.6	937.1
PGE	CUSTOM-Lighting Only	0	51.4%	51.4%	11.6	2.3	0.3	0.2
PGE	CUSTOM-Other	0	7.3%	7.3%	11.2	2.3	0.2	0.2
RCEA	Non-sampled	0	100.0%	100.0%	11.7	604.6	134.8	51.3
SCG	CUSTOM-Other	0	0.0%	0.0%	5.0	0.0	0.0	0.0
SCG	Non-sampled	0	0.0%	0.0%	15.6	0.0	0.0	0.0
SDGE	CUSTOM-Other	0	0.0%	0.0%	3.0	-200,335.5	-51,565.1	-66,778.5
SDGE	SBD-Other	0	0.0%	0.0%	12.4	295,853.4	19,181.8	20,484.7

Per Unit (Quantity) Net Energy Savings (Therms)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
MCE	CUSTOM-Lighting Only	0	100.0%	100.0%	12.0	-2.7	-0.5	-0.2
MCE	CUSTOM-OthNetNon-samp	0	100.0%	100.0%	15.0	-1,101.8	-71.3	-73.5
PGE	CUSTOM-Lighting Only	0	51.4%	51.4%	11.6	0.0	0.0	0.0
PGE	CUSTOM-Other	0	7.3%	7.3%	11.2	-0.1	0.0	0.0
RCEA	Non-sampled	0	100.0%	100.0%	11.7	-7.3	-3.0	-0.6
SCG	CUSTOM-Other	0	0.0%	0.0%	5.0	1,489,393.3	492,057.6	484,729.6
SCG	Non-sampled	0	0.0%	0.0%	15.6	6,337.5	273.8	384.1
SDGE	CUSTOM-Other	0	0.0%	0.0%	3.0	0.0	0.0	0.0
SDGE	SBD-Other	0	0.0%	0.0%	12.4	35,531.7	1,800.5	2,525.4

APPENDIX F. RESPONSES TO COMMENTS ON DRAFT REPORT

Table F-1 presents DNV's responses to the comments on the draft report that were received during the public review period.

Table F-1. Responses to comments on draft report

From	Comment	DNV Response
PG&E	Several projects are determined invalid due to policies that the PAs have in place to minimize risk in their portfolios. Policies such as requiring projects to submit exceptions if requesting an extension to the project installation deadline, and requiring measures to be in operation for 5 years after installation. These policies are not CPUC requirements or program eligibility requirements, and therefore should not affect the validity of the project savings. PG&E would appreciate further discussion on the practice of invalidating projects base on these policies.	Consistent with previous evaluations, DNV used the Statewide Custom Project Guidance Document, program-specific manuals, statewide custom program and policy manual, various CPUC decisions and resolutions, CPUC EE Policy Manual, CPUC guidance, CPR directives, as the primary sources to determine project eligibility. DNV and the CPUC will review future eligibility requirements and update accordingly and looks forward to further discussion with PG&E and the other PAs. Sources: Measures must operate at least five years: https://www.sdge.com/sites/default/files/2021Customized%20PolicyProcedureManualVERSION1.pdf; Project extension requirement, as outline in the workplan: https://pda.energydataweb.com/#!/documents/3867/view
PG&E	PG&E is concerned that the current ex-post survey instrument & algorithms exhibit flaws and embedded biases that pushes the NTGR distribution within the 1/3 and 2/3 range. As a result, it's not very meaningful to be obsessive about high "precision" of the two-digit decimals produced out of the flawed algorithms. In addition, the report seems to imply that evaluators don't have sufficient evidence or confidence in expecting consistent NTGR values derived from the same information, for example, it's hard to expect that two independent users of the same NTGR instrument will produce the same NTGR value in the first place. Lastly, there are concerns on how well the evaluators assess the influence levels associated with various driving factors (e.g., company sustainability policy). PG&E would appreciate further discussion on these algorithms and how they may be improved in the future.	This NTG instrument used in CIAC evaluation was vetted in 2010 and used consistently since. However, we recognize there are areas of potential improvements in the current instrument and anticipate a review and update to the NTG approach. Regarding the corporate sustainability driver, as noted in the report, our method did not penalize projects on the NTG scoring if the survey respondent indicated that a corporate sustainability policy was helping to drive the project. While the current CIAC NTG method, which has been vetted by the stakeholders for over a decade, produced reliable estimates of program attribution, we are open to revisit the current NTG method to understand the potential gap and update the instrument for better alignment with the current program design and delivery in the coming evaluation cycles.
SDG&E	Some recommendations are repeated from the body of the report to the "Conclusions and Recommendations" in Section 5, but have different recommendation #'s associated with them. To help eliminate confusion, SDG&E recommends the report author to synchronize the conclusion and recommendation #'s throughout the document. i.e. Recommendation 9 on pg. 10 is the same as recommendation 2 on pg. 56	Thank you for the comment. In order to limit the length of the executive summary, only the most impactful conclusions and recommendations were included. As such, number alignment with the main body is not always possible. We will make note of this in the report.
SDG&E	SDG&E seeks to better understand the rationale and associated policy for why projects flagged as ineligible due to administrative reasons (i.e. not filing an installation date extension) are assigned a GRR of zero. Although there is an administrative error that does not conform with program rules, the project was ultimately installed and did provide grid benefit. Additionally, the program did influence the customer to participate in the program, ultimately providing benefit to ratepayers	As noted in Table 4-3 of the CIAC PY2022 Evaluation Final Workplan, "If the measure was not installed within the allowed installation time specified as program requirement and/or customer agreement for installation, the project is ineligible". "If there is documentation by the PA for authorizing installation time extension(s) in a timely manner, then the project is eligible." As described above, when documented extensions are not provided, projects are ineligible and no savings are attributed to the associated claim(s). Source: https://pda.energydataweb.com/#!/documents/3867/view
SDG&E	SDG&E recommends including the ex-post survey as part of the installation process or part of the ex-ante documentation. This with help mitigate the risk of not gathering information about post-installation from the customer directly. We recommend the commission document standard criteria outlining what minimum ex-post data should be captured.	Both the Basic and Enhanced rigor surveys are included as part of the CIAC PY2022 Evaluation Final Workplan on PDA; https://pda.energydataweb.com/#!/documents/3867/view. DNV will also include these as attachments in PDA to the final report.

From	Comment	DNV Response
SDG&E	CIAC 2022 evaluation report section 2.3 provides a list of CPUC policies and guidance. However, the HOPPS rulebook is not on the list. SDG&E recommends including the HOPPS rulebook in this section as HOPPS projects have been included in the CIAC evaluation package.	Thank you for the comment. The HOPPS rulebook will be added to the list of CPUC policies and guidance of the final report.
SDG&E	Counter to the comment in recommendation 4, SDG&E does not agree that all MAT's are "clearly defined." To meet the requirement, SDG&E utilizes the available tables (i.e. Statewide Custom Project Guidance Document v.1.4, Table-2, pg. 8) to decipher which MAT is applicable to each claim.	Thank you for the comment. The final report will be revised to "MATs are defined in the Statewide Custom Project Guidance Document version 1.4 and should be used when determining the appropriate MAT".
SDG&E	Considering all new programs are handled by 3rd parties, the PAs do not normally contact customers directly. It won't be practical for PAs to provide updates to the customer contacts on a "regular basis." However, as SDG&E has always done, we will continue to work side-byside with the ex-post reviewers in contracting the appropriate people for the selected projects.	Thank you for the comment. DNV and the CPUC staff appreciate SDG&E and the other PA's continued support in evaluation efforts.
SDG&E	Recommendation 9 does not clearly align with Conclusion 9. SDG&E seeks clarification on why the need to include permitting documents is necessary to confirm if measures exceed baseline performance. The need to provide additional documentation not required by decisions and resolutions makes projects more burdensome for all parties.	Thank you for the comment. The wording has been revised to the following: "The PA should provide all necessary information to show that installed measures exceed baseline energy performance and if permitting document is one of them then that should be submitted to the CPUC as part of the package."
SDG&E	CEDARS claims are limited to a single account. If the claims were required to cover more than one account and address each on an individual basis, it would be a burden to the customer as they would have to fill out multiple documents specific to each meter rather than encompassing several meters on one document. SDG&E prefers to perform this task on a premise basis.	Thank you for the comment. Alignment of CEDARS claims on a premise basis is acceptable.
SCG	3.3.2 NTGR estimation approach and scoring – Page 25 of Report: SoCalGas respectfully requests DNV to provide further detail, including the survey instrument, used to determine the net-to-gross values for this evaluation. Although insight into what certain responses contributed to the calculation of net-to-gross were included in the report, including details on what specific questions and how they were delivered to respondents can provide a holistic and transparent picture of how the net-to-gross was derived. This additional information is in an effort to achieve even better net-to-gross results in future program cycles.	Both the Basic and Enhanced rigor surveys are included as part of the CIAC PY2022 Evaluation Final Workplan on PDA; https://pda.energydataweb.com/#!/documents/3867/view. DNV will also include these as attachments in PDA to the final report.
SCG	Conclusions and Recommendations - #24 – Page 61 of Report: The transition to third-party programs impacts the customer outreach and identifying custom projects. This transition takes time for the implementers to launch and develop programs that would increase participation in a custom framework.	Thank you for the feedback.
SCG	Conclusions and Recommendations - #25 – Page 61 of Report: SoCalGas requests DNV to provide further explanation and analysis in the report to illustrate how the recommendation to help participants acknowledge that the EE measure was as a result of PA recommendations, and not before the PA engagement, can be achieved. SoCalGas would appreciate specific examples and guidance that can be referenced to incorporate into future efforts. The effort to provide specific equipment education and training, as mentioned in other recommendations may be a specific example. Providing the survey instrument can also help pinpoint the efforts on this recommendation to help further improve net-to-gross values in future program years.	Good question. Three screening questions that help identify projects that might be at risk of high free ridership are presented below. All these questions appear in the NTG guides used for the PY2022 evaluation: 1) "Was the decision to install this MEASURE made before or after you began discussions with <RELEVANT PA> regarding the availability of incentives or technical assistance for this MEASURE?" 2) "Now, using this 0-to-10 rating scale, where 0 means “Not at all important” and 10 means “Extremely important,” please rate the importance of each of the following in your decision to implement this MEASURE at this time ... Payback or return on the PROJECT". The importance of this question as a differentiator between high NTGR and low NTGR projects is spelled out in the report in Recommendation #25: "In the PY2022 evaluation, 82% of the participants with top quartile NTGRs rated payback/ROI considerations important, while only 13% of those in the bottom NTGR quartile did." 3) "Did the rebate move your project within this acceptable [PAYBACK/ROI] range?"

From	Comment	DNV Response
		Both the Basic and Enhanced rigor surveys are included as part of the CIAC PY2022 Evaluation Final Workplan on PDA; https://pda.energydataweb.com/#!/documents/3867/view. DNV will also include these as attachments in PDA to the final report.

About DNV

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